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The Commonwealth of Massachusetts

ANNUAL REPORT

*Massachusetts*  
OF THE

METROPOLITAN DISTRICT  
WATER SUPPLY COMMISSION

FOR THE

YEAR ENDING NOVEMBER 30, 1937



*3490*



# REPORT OF THE METROPOLITAN DISTRICT WATER SUPPLY COMMISSION

*To the Honorable the Senate and House of Representatives of the Commonwealth  
of Massachusetts in General Court Assembled.*

The Metropolitan District Water Supply Commission, established under the provisions of Chapter 375 of the Acts of 1926, respectfully presents for the year ending November 30, 1937, its

## TWELFTH ANNUAL REPORT

### I. ORGANIZATION AND ADMINISTRATION

Eugene C. Hultman continued as Chairman of the Commission and Thomas D. Lavelle and Edward J. Kelley as Associate Commissioners. R. Nelson Molt continued as Secretary. Three special agents under the direction of the Commission continued to care for the property acquired by the Commission in the Swift River and Ware River areas.

Real estate purchasing agents and conveyancers and other experts were employed as needed. The engineering and clerical force of the engineering department averaged 157 employees during the year. The maximum number employed at any one time by contractors on the various construction projects during the year was 536 persons.

A force of local labor of 96 persons was employed during the year in forestry and reforestation work, the removal of bodies, miscellaneous work and burning brush and slash on the area below the future reservoir flow line, subsequent to the discontinuance on January 22, 1937 of the unemployment relief project undertaken in 1936 under the instructions of the Honorable Governor and Council.

The clerical force of the Commission's office was reduced upon the cessation of the clearing project work.

During the year, disposition by trial was made by the Attorney General as counsel for the Commission of pending petitions for damages and the petition of Maher and Duggan before a Board of Referees for land owned by them in the town of Greenwich, this being the second trial of the petition.

### II. ENGINEERING DEPARTMENT

Frank E. Winsor continued as Chief Engineer, Karl R. Kennison as Assistant Chief Engineer, Walton H. Sears as Mechanical Engineer and William W. Peabody as Division Engineer of the Quabbin Reservoir and Aqueduct Division with an office at Enfield, Massachusetts.

At the request of the Attorney General consultants were employed from time to time when necessary in preparation of data for the defense of petitions for damages against the Commonwealth and for the collection and interpretation of data on mill and water power damages, and on design of dam and dike of Quabbin Reservoir and geological data.

### III. OFFICES.

The office of the Commission and of the Chief Engineer continued on the ninth floor of the Metropolitan District Commission building at 20 Somerset Street, Boston. Offices at various places on the work were occupied from time to time as required and the laboratories for water analysis and soil testing were continued at Enfield.

### IV. REAL ESTATE AND WATER RIGHTS

The Commission, for reservoir purposes and sanitary protection, has acquired a total of approximately 69,791 acres of land in the Swift River watershed, and for sanitary protection and construction purposes in the Ware River watershed a total of about 13,849 acres.

The Commission in September, 1937, as a sanitary measure, ordered that all future farm operations cease on areas owned by the Commission within the area

*Mass. Secretary of the Commonwealth  
May 19, 1938*



to be flowed by Quabbin Reservoir and that all buildings owned by the Commission in the town of Prescott be sold and removed as soon as possible as well as all buildings owned by the Commission within six miles of the Intake Building at Coldbrook at the Ware River watershed.

The Commission publicly advertised from time to time for sealed proposals for the purchase of about sixteen million feet of standing timber within the area to be flowed by Quabbin Reservoir and accepted the highest proposals received therefore.

#### V. WARE RIVER SUPPLY

The Rutland-Holden sewer was operated throughout the year to divert from the Ware and Wachusett watersheds the sewage of the U. S. Veterans Hospital and the State Sanatorium in Rutland.

Water was diverted from the Ware River from time to time between December 12, 1936, and January 9, 1937 inclusive, and the temporary chlorinating plant in the upper watershed of the Ware River was operated from time to time as required.

Real estate and topographic surveys were carried on during the year and preparation of record and taking plans of property acquired were continued.

Reforestation and sanitary surveys were continued, and area within six miles upstream from the Intake Building at Coldbrook bounded and "No Trespassing" signs posted.

The remaining buildings of the former Prison Camp at Rutland were publicly advertised and sold at public auction and the area generally cleaned up.

Upon the request of the Department of Conservation the Commission permitted the use of Cunningham Pond, so-called, in the town of Hubbardston as a breeding pond for fish under the supervision of said Department.

#### VI. SWIFT RIVER SUPPLY

Real estate and topographic surveys were continued during the year. Reforestation of areas above the flow line of Quabbin Reservoir was continued and additional nurseries established, seed beds planted and transplanting and seedlings carried on. Surveys of a general taking for Quabbin Reservoir area were in progress and a taking line generally established and voted by the Commission. The Commission continued its policy of salvaging young pine, spruce, hemlock, laurel, azaleas, etc., to be flooded by Quabbin Reservoir.

Full cooperation was secured from the officials of the Harvard State Forest in the town of Petersham and their expert opinion secured relative to the planting of seed beds and cultivation and care of seedlings and reforestation program.

Fire lanes were kept clear above the flow line of Quabbin Reservoir affording protection to the transplants set out on the watershed of Quabbin Reservoir as well as the large areas of standing timber.

In view of the great amount of brush and slash left from timber operations and the remains of the clearing project the Commission is gratified to report no loss of timber on land of the Commonwealth by fire during the past year, all incipient fires being put out promptly without damage by the equipment of the Commission under the direction of the engineering force.

The Two Companies, Inc., completed the work under Contract 38, for the construction of a core wall to sound rock at the site of the main dam of Quabbin Reservoir. The final estimate under said contract being paid and a release of any and all claims of the Two Companies, Inc., being received upon advice and with the approval of the Attorney General of the Commonwealth.

Cenedella & Company completed the work under Contract 49 for excavating diversion channels at Shafts 11A and 12 of Quabbin Aqueduct. Cenedella & Company presented claims which the Commission refused to pay and referred the matter to the Attorney General.

Franklin A. Snow Company completed the work under Contract 51, for constructing the East Branch Baffle at the site of Quabbin Reservoir in the towns of Greenwich and Hardwick and presented claims which the Commission refused to pay, and, suit being brought, the matter was placed in the hands of the Attorney General for defense.



Vincent Caira, Newtonville, Mass., completed work under Contract 47 for constructing the service building and the head house at Shaft 12 of Quabbin Aqueduct in the town of Greenwich and the English Construction Company, Lowell, Mass., completed the work under Contract 53 for constructing the head house at Shaft 9 of Quabbin Aqueduct in the town of Barre.

Carlo Bianchi & Company, Inc., Framingham, Mass., completed work under Contract 54 for constructing and improving a section, in the towns of Dana and Petersham, of the highway along the east side of the future Quabbin Reservoir.

Contract 55 awarded to Arute Bros., Incorporated, Bridgewater, Mass., and Contract 57 awarded to John Iafolla Construction Company, Dedham, Mass., were completed and this State highway, eight miles long, extending across the northerly end of the Quabbin Reservoir from Petersham to a connection near North New Salem with the Daniel Shay Highway, Route 202, was turned over to and accepted by the Department of Public Works to be thereafter maintained by it as part of the highway system of the Commonwealth.

Benjamin Foster Company continued work under Contract 52, for constructing the embankment of the main dam of Quabbin Reservoir in the towns of Belchertown, Enfield and Ware. The central portion of the embankment has been carried to about elevation 462, a height of 81 feet above the original river bed, and approximately 1,997,000 cubic yards out of a total of 3,695,000 cubic yards required in the embankment under this contract having been placed to date.

The policy of publicly advertising for bids on all construction work was continued and Contract 56 was awarded on June 24 to Rich Bros. Construction Co., Inc., Boston, Mass., the lowest bidder, for constructing the administration buildings at the main dam of Quabbin Reservoir in the town of Belchertown. Work is in progress under this contract.

Contract 59 was awarded on March 18 to the Wachusett Artesian Well Company, West Boylston, Mass., the lowest bidder, for drilling a well for the water supply of the administration buildings in the town of Belchertown. The work was completed.

The Commission on November 2 authorized the advertising for sealed proposals to be publicly opened and read on December 2, 1937, for constructing access roads to Shaft 12 of the Quabbin Aqueduct in the towns of Hardwick and Greenwich.

## VII. GENERAL

The engineering force continued its studies for the development of hydro-electric power at various points on the work. No electric power can be generated, however, until the completion of Quabbin Reservoir provides the necessary storage of water.

At the request of His Excellency the Governor and the Honorable Council, the Commission submitted the following communications relative to the work of the Commission:

November 1, 1937.

SUBJECT: Work under Way and in Prospect.

*Eugene C. Hultman, Esq., Chairman,  
Met. Dist. Water Supply Commission,  
20 Somerset Street, Boston, Mass.*

DEAR SIR: In compliance with your request, I submit herewith a statement of work required to be done to complete the work entrusted to the Metropolitan District Water Supply Commission under Chapter 375 of the Acts of 1926 and Chapter 321 of the Acts of 1927, and also work required under Chapter 48 of the Resolves of 1936.

### *Contracts in Progress*

*Contract 50.* Embankment at Dike. This work is nearing completion and is expected to be completed this year.

*Contract 52.* Embankment at Main Dam. Contract required to be completed in 1940.

*Contract 56.* Administration Buildings at Main Dam. Required to be completed in 1938.

*Contract 58.* Borings in connection with investigations for pressure tunnel under Chapter 48 of Resolves in 1936. Work is expected to be completed during November, 1937.

*Equipment for Shaft 12 and for Main Dam.* To be delivered in 1937-1938.

#### *Other Work in Preparation*

Contract for road leading to Shaft 12, about two miles in length, to be completed in 1938.

Maintenance building at Shaft 8, to be completed in 1938.

Maintenance building at Shaft 1, to be completed in 1939.

Building at outlet chamber and power plant at Main Dam, to be completed in 1940.

Equipment for hydroelectric plant at Main Dam, to be completed in 1940.

Equipment for gates at Shaft 1 of Quabbin Aqueduct, to be completed in 1938.

Equipment for hydroelectric plant at Shaft 1 of Quabbin Aqueduct, to be completed in 1940.

Quinapoxet diversion works into Quabbin Aqueduct, to be completed in 1939.

Shallow flowage dam on upper end of East Branch of Quabbin Reservoir, near outlet of Pottapoag Pond, to be completed in 1938.

Shallow flowage dam in upper end of Middle Branch of Quabbin Reservoir, to be completed in 1938.

Clearing and cleaning up areas to be flowed by Quabbin Reservoir so far as practicable as the water rises, to be done from 1938 to 1945.

Fire stop lanes and narrow gravel access roads leading to Quabbin Reservoir for forest fire prevention, with similar work on the Ware River near Coldbrook, to be done from 1938-1940.

Reforestation of areas to be purchased around Quabbin Reservoir and in the Ware watershed, to be completed in 1945.

Landscaping at Dam and Dike, at Shaft 12 and around other structures as required, to be completed in 1938 to 1941.

Roads, etc., connecting the Main Dam and Dike and passing over Quabbin Hill, to be completed in 1940.

Gaging station on Swift River below Main Dam, to be completed in 1939.

Improvement of sanitary conditions on Ware and Wachusett watershed, to be done in 1938 to 1940.

#### *In Addition to the Preparation of Designs and Supervision of Construction, the Engineering Force is charged with the following work:*

*Surveys.* Completion of real estate surveys and plans, at Quabbin Reservoir and on the Ware River. Exclusive of tunnel takings, 83,548 acres have been purchased to Oct. 23, 1937, of which 80,291 acres have been surveyed, and final tracings made of about 46,200 acres. From 15,000 to 20,000 acres of additional land will be required to be surveyed and final tracings will be required of about 55,000 acres. Topographic surveys have been made to Oct. 23, 1937, of 42,423, of which about 39,000 have been traced. Additional topography to cover roads for fire stops, swamp drainage, etc., will involve an additional 10,000 to 15,000 acres of surveys.

As a comparison it is of interest to note that the land area of the City of Boston is only 28,100 acres, and of the twenty cities and towns making up the Metropolitan Water District only about 117,000 acres.

*Cemeteries.* The total number of bodies to be removed is estimated to be in excess of 6,000, of which 4,285 have been removed to Oct. 23, 1937.

*Chapter 48, Resolves of 1936.* Chapter 48 of the Resolves of 1936 provides "for an investigation by the Metropolitan District Water Supply Commission and the Department of Public Health relative to improving the distribution of water and more adequately preventing pollution of the sources of water supply of the Metropolitan Water District."

This investigation is being made by the force of the Commission, and borings are nearing completion under Contract 58.



Surveys for a pressure tunnel or pressure aqueduct from the terminal chamber of the Wachusett Aqueduct in Northboro to the Metropolitan District in Weston, and surveys for a pressure tunnel forming a loop through the Metropolitan Water District are in progress and are well advanced. Sanitary surveys of the watersheds of the Sudbury, Wachusett, Ware and Swift supplies are practically completed. Aerial maps showing these surveys have been prepared, and work is in progress on a report of sanitary conditions throughout the areas used for Metropolitan Water Supply.

A report on this investigation is required to be available for consideration by the Legislature of 1938, and this report will include preliminary designs for pressure tunnel and shafts, pressure aqueducts, distribution reservoirs and other appurtenances. Maps showing the location, depth and geology of the tunnel location and a draft of suggested legislation will accompany the report.

*Takings.* The preparation of general taking plans, both for Quabbin Reservoir and the Ware, will be necessary and will involve additional surveys of outer boundaries in order to define these boundaries by courses and distances. The taking plans for Quabbin Reservoir will involve a change in town and county lines and should be completed and recorded in 1938. The taking plans for the Ware will probably be completed and recorded in 1939 or 1940.

The outside boundaries of all takings will be marked by stone bounds in accordance with the practice of the Metropolitan District Commission, and it is estimated that from 1,500 to 2,000 such bounds will be required.

Preparation for defense of river diversion suits due to the prospective taking of waters of the Swift River. Several large suits are still in prospect because of this diversion.

Preparation for defense of suits for land takings, etc., which will probably be brought when final takings are filed.

#### *Contract Drawings, Specifications and Supervision of Construction*

In addition to contract drawings and specifications required for the greater part of the above items, working drawings are required, lines and grades are given for construction, careful inspection is required, and measurements (usually semi-monthly) are made for partial payments to contractors. Final measurements and estimates are made at the completion of contracts.

*Equipment.* Several boats, including at least two power boats and at least one hydroplane, will be required for rapid transportation for fire prevention, inspection, etc., and it will be desirable to provide several landings around Quabbin Reservoir. This equipment, including fire apparatus, should be available in 1940 to 1941. The sanitary control and care of the large areas owned by the Commission on the Swift and Ware watersheds, some 145 square miles or nearly three times the land area of the City of Boston and three-fourths of the combined land area of the cities and towns constituting the present Metropolitan Water District, will require adequate equipment which should be so housed as to be quickly available as needed. The sanitary inspection of the entire tributary watersheds of the Swift, Ware and Wachusett supplies, about 400 square miles, may be advantageously combined in the future when hydroplane transportation becomes available.

*Record Plans.* Record plans must be prepared of all structures as built. Some work has been done on such plans, as time has permitted, and these plans should be completed while the men familiar with the work are still available. It is essential for the proper maintenance and operation of the work that such plans be accurate and be prepared with great care, so far as practicable, by the men who had been connected with the construction. Owing to the pressure of other work, new contracts, etc., there still remains much of this important work to do.

The Department of Public Works requires record plans of the 34 miles of State road which have been or will be accepted by it. Record plans for 5 miles of these roads have been furnished to the Department and the remainder are being prepared.

The above summary is not intended to be a complete statement of all work to be done, but to cover only the more important obvious items required for completion of the project.

Respectfully,

FRANK E. WINSOR, *Chief Engineer.*



November 2, 1937.

SUBJECT: Administration, Engineering, etc.  
Overhead Costs

*Eugene C. Hultman, Esq., Chairman, Met. Dist. Water Supply Commission,  
20 Somerset Street, Boston, Mass.*

DEAR SIR: The cost of overhead, including administration, engineering, etc., for the Metropolitan District Water Supply Commission from the inception of the work in 1926 to October 1, 1937, is as follows:—

Administration . . . . .		\$316,050.	0.78%
Engineering:			
Commission's Payroll . . . . .	\$3,161,406.		
Other expenses including sub-surface investigations by wash and diamond drill borings, test pits, aerial surveys, transportation and incidentals . . . . .	592,765.		
Consultant expenses:			
Design and construction . . . . .	88,000.		
Connecticut case . . . . .	49,942.		
Boston & Albany R.R. and other real estate . . . . .	10,781.		
Diversion Damages:			
General investigations, preparation for trial and settlements . . . . .	124,342.		
Used at trials . . . . .	75,473.	4,102,709.	10.12%
Real Estate including appraisals, legal expenses, etc.		270,486.	.67%
Legal and expert expense other than engineering in connection with settlement and litigation of diversion claims:			
Expenses of trials . . . . .	95,723.		
Cost of preparation, cases litigated . . . . .	103,000.		
Cost of preparation, negotiated settlements . . . . .	153,776.	352,499.	.87%
Police and fire protection . . . . .		73,922.	.18%
Total . . . . .		\$5,115,666.	12.62%
Total expenditures to Oct. 1, 1937 . . . . .		\$40,642,683.	
Expended on special investigations, chapters 18 and 48 of 1936 and not included in above tabulation of overhead expenses . . . . .		108,536.	
Amount used in computation of percentages in above tabulation . . . . .		\$40,534,147.	

Respectfully,

FRANK E. WINSOR, *Chief Engineer.*

November 1, 1937.

SUBJECT: Expenditures

*EUGENE C. HULTMAN, ESQ., Chairman,  
Met. Dist. Water Supply Commission,  
20 Somerset Street, Boston, Mass.*

DEAR SIR: I attach hereto for your information statement of amount authorized for use of the Metropolitan District Water Supply Commission, together with a statement of expenditures to date and total estimated expenditures for completion of the work.

I call your attention to expenditures aggregating about \$350,000 which are included in the expenditures to November 1, 1937, of \$40,919,939.67 and which were not contemplated in the original plan. These expenditures include investigation and construction of the Rutland-Holden sewer under Chapter 66 of the Resolves of 1931 and Chapter 262 of the Acts of 1932; investigation of the use of Lake Cochituate for recreational purposes, etc., Chapter 18 of the Resolves of 1936; and investigation for improvement of the distribution system and sanitary protection of Metropolitan water, Chapter 48 of the Resolves of 1936.

It has been my endeavor to allow liberally for future expenditures, and it is quite possible that the total expenditures may be substantially less than indicated, in which case the surplus will be increased by the same figure.

Respectfully,

FRANK E. WINSOR, *Chief Engineer.*

The following memorandum shows the approximate financial status of the work of the Metropolitan District Water Supply Commission as of November 1, 1937:

## MONEY AVAILABLE

## Original authorizations:

Chapter 375 of the Acts of 1926 . . . . .	\$15,000,000.00	
Chapter 321 of the Acts of 1927 . . . . .	50,000,000.00	
Chapter 111 of the Acts of 1927 \$900,000.00. Of the money authorized by Chapter 111 in the Sudbury River District, \$638,533.83 was spent and the remainder has reverted to the Treasury . . . . .	638,533.83	\$65,638,533.83

Receipts to Nov. 1, 1937 . . . . .		\$860,351.33
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Total available funds for work . . . . .		<u>\$66,498,885.16</u>
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## ESTIMATE OF EXPENDITURES

Expenditures to Nov. 1, 1937 (Includes about \$350,000 for work not originally contemplated) . . . . .		\$40,919,939.67
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## Contracts:

No. 33, New England Power Co. Electric Current . . . . .	10,000.00	
No. 47, Vincent Cairn. Buildings at Shaft 12 . . . . .	4,000.00	
No. 49, Cenedella & Co. Diversion Channels, Quabbin Reservoir . . . . .	2,500.00	
No. 50, The Arthur A. Johnson Corp. Embankment at Dike . . . . .	150,000.00	
No. 52, Benjamin Foster Co. Embankment at Main Dam . . . . .	1,660,000.00	
No. 53, The English Construction Co. Building at Shaft 9 . . . . .	1,200.00	
No. 57, John Iafolla Construction Co. Petersham-New Salem Road . . . . .	20,000.00	
No. 58, Pennsylvania Drilling Co. Borings in connection with investigations for pressure tunnel, under Chapter 48 of Resolves of 1936 . . . . .	15,000.00	
No. 56, Rich Bros. Construction Co., Inc. Administration Buildings at Main Dam . . . . .	327,000.00	
Miscellaneous small contracts . . . . .	60,000.00	
Without contract price:		
Stop shutters, racks, etc. Shaft 12 and at Main Dam . . . . .	40,000.00	
Equipment for Administration Buildings, hydroplane, boats and furnishings . . . . .	100,000.00	
Superstructure, water wheel, generator, etc. outlet works at Main Dam . . . . .	150,000.00	
Clearing of Quabbin Reservoir, including reclearing from time to time as water rises . . . . .	3,000,000.00	
Fencing . . . . .	750,000.00	
Reforestation, fire stops, fire lanes, etc. . . . .	600,000.00	
Removal of cemeteries . . . . .	60,000.00	
Shallow flowage dams—one on the East Branch and one on the Middle Branch of the Swift River . . . . .	200,000.00	
Service building at Shaft 8 . . . . .	20,000.00	
Service building at Shaft 1 . . . . .	10,000.00	
Valves, water wheels, generator, etc. at Shaft 1 . . . . .	80,000.00	
Gaging station below Main Dam of Quabbin Reservoir . . . . .	50,000.00	
Road connecting Dam and Dike over Mount Quabbin, together with miscellaneous landscaping, etc. . . . .	250,000.00	
Extensions and connections to Worcester-Holden sewer . . . . .	75,000.00	
Quinapoxet diversion works . . . . .	200,000.00	
Improvement of swamps . . . . .	200,000.00	
Real Estate:		
Purchases, taxes and miscellaneous costs . . . . .	1,250,000.00	
Diversion damages . . . . .	3,000,000.00	
	<u>\$12,284,700.00</u>	
Administration, engineering and general overhead, 10% . . . . .	1,228,470.00	\$13,513,170.00
Total estimated expense . . . . .		<u>\$54,433,109.67</u>
Estimated surplus . . . . .		\$12,065,775.49

November 2, 1937.

MR. EUGENE C. HULTMAN, *Chairman,*  
20 Somerset Street, Boston, Massachusetts.

DEAR SIR: I attach hereto a tabulation of the amount of the verdicts of the diversion cases tried and trial expenses, showing maximum estimates reported by the Commission's engineers and the claim of the owners at the trials.

There is also attached a list of the cases settled by the Commission for the Swift and Ware diversions, showing the amounts paid, the estimates of the commission's engineers and the claims of the owners.

Finally, there is attached a memorandum of the verdicts in the two trials of the Maher & Duggan case, showing the claims of the owners.

Very truly yours, R. NELSON MOLT, *Secretary.*

November 1, 1937

## VERDICTS OF CASES TRIED AND TRIAL EXPENSES

<i>Amounts of Verdicts</i>	<i>Judgments, Interest and Costs</i>	<i>Maximum Damage Estimates Reported by Commission's</i>		<i>Trial Expenses</i>
		<i>Engineers</i>	<i>Owners</i>	
BARRE WOOL COMBING CO. (Verdict returned 7/20/35)	\$189,304.67	Judgment, including interest from 7/20/35-9/3/35, and costs of suit, \$26.50	\$190,208.95	\$807,100.00
GEO. H. GILBERT MFG. CO. Original verdicts \$45,856.25 259,852.08	305,708.33	New trial ordered in case in Hampshire County and settlement made for	260,000.00	1,111,000.00
(Verdicts returned 1/4/34)				29,757.55
ARTHUR W. HOLBROOK (Verdict returned 7/24/36)	9,660.00	Judgment, incl. interest & costs (Judgment incl. int. (Costs \$9,697.03) 288.50)	9,985.53	No admission of damages
LUDLOW MANUFACTURING CO. (Verdict returned 12/22/36)	52,275.00	Judgment, incl. interest & costs (Judgment incl. int. (Costs \$52,623.50) 395.00)	53,018.50	50,000.00
NATIONAL SCALE CO. (Verdict returned 1/15/37)	Verdict for Commonwealth			41,041.87
OTIS COMPANY Original verdicts \$29,698.00 162,699.97	192,397.97	Judgment, incl. interest & costs (Judgment incl. int. (Costs 29,816.79) 48.50) (Judgment incl. int. (Costs 163,350.77) 763.99)	193,980.05	No admission of damages
(Verdicts returned 4/17/36)				4,456.18
WARE WOOLEN COMPANY (Verdict returned 1/30/36)	88,786.91	Judgment, incl. interest & costs (Judgment incl. int. (Costs 89,142.06) 778.15)	89,920.21	97,000.00
WARE VALLEY MFG. COMPANY (Verdict returned 6/17/36)	17,765.22	Judgment, incl. interest & costs (Judgment incl. int. (Costs 18,042.36) 488.55)	18,530.91	296,200.00
				29,307.53
				13,912.82
				\$179,458.37
	\$855,898.10		\$815,644.15	\$483,165.00
				\$2,634,100.00



CASES SETTLED BY AGREEMENT

Company	Located on	Diversion Covered by Settlement	Amount Paid	Date of Payment	Estimate of Commission's Engineers	Claims of Owner	Remarks
Ames Sword Co. . . . .	Chicopee	Ware & Swift	\$ 2,500.00	2/7/34	\$ 7,000.00	\$ 15,000.00	
Barre Falls Reservoir Co. . . . .	Ware	Ware	4,800.00	12/5/36	.....	7,500.00*	Settlement, made by Office of Attorney General after jury was impaneled, includes purchase by Commonwealth of real estate and Water rights
Dana S. Courtney Co. . . . .	Chicopee	Ware & Swift	10,000.00	5/9/34	8,500.00	16,000.00	
Chicopee Mfg. Corporation . . . . .	Chicopee	Ware & Swift	250,000.00	8/10/33	300,000.00	375,000.00	
Dwight Mfg. Co. . . . .	Chicopee	Ware & Swift	225,000.00	12/2/31	275,000.00	275,000.00	
Indian Orchard Co. . . . .	Chicopee	Ware & Swift	375,000.00	9/28/34	393,600.00	425,000.00	
Northern Conn. Power Co. . . . .	Conn.	Ware & Swift	30,000.00	8/1/34	20,000.00	201,000.00	
Quinnehtuk Company . . . . .	Chicopee	Ware & Swift	140,000.00	7/12/33	135,000.00	153,000.00	
T. E. Rich Company . . . . .	Ware	Ware	3,250.00	6/26/33	5,000.00	5,000.00	
A. G. Spalding & Bros. . . . .	Chicopee	Ware & Swift	12,000.00	8/9/33	12,000.00	12,000.00	
Thorndike Co. . . . .	Ware	Ware	25,000.00	4/28/32	32,500.00	172,500.00	
Geo. W. Wheelwright Paper Co. . . . .	Ware	Ware	35,000.00	5/24/33	18,000.00	75,000.00	

\* For damages only—does not include real estate

VERDICTS OF MAHER & DUGGAN CASE

November 1, 1937

FIRST TRIAL	Amounts of Verdicts	Amounts Paid (Finding, interest, etc.)		Maximum Damage Estimates Reported by Commission's Engineers		Claims of Owners		Trial Expenses
		Hearing before Board of Referees. by Supreme Court.	Retrial ordered					
MAHER & DUGGAN (Finding returned 1/25/34)	\$221,000.00			\$57,000.00		\$400,000.00		\$14,192.63
SECOND TRIAL (Finding returned 7/28/37)	150,000.00	Finding, including interest from 9/15/33 - 7/29/37 at 5% per annum	\$179,041.67	57,000.00		365,000.00		29,664.69
		Finding Interest	\$150,000.00 29,041.67					

November 1, 1937.

SUBJECT: Quabbin Reservoir— General Road Program

EUGENE C. HULTMAN, ESQ., *Chairman,*  
*Met. Dist. Water Supply Comm.*  
*20 Somerset St., Boston, Mass.*

DEAR SIR:—The Metropolitan District Water Supply Commission under the provisions of Chapter 321 of the Acts of 1927 was charged with the duty of providing when reasonably practicable and public necessity or convenience required, other suitable ways in lieu of those in the Quabbin Reservoir area which would be discontinued by the construction of the reservoir. The practicability, public necessity and convenience and the location and character of any such new ways to be determined by agreement between the Commission and the county commissioners of the county or counties in which any such discontinued ways were situated and if they were unable to agree by the Department of Public Works.

At the time of the passage of the Act there was a north and south road through the Swift River Valley, a narrow tarred gravel road being a part of Route #21 and running generally from Springfield through Ludlow and Belchertown and thence through Enfield, Greenwich and North Dana to Athol. The other main thoroughfare was a road leading from Ware to the village of Enfield and thence to the town of Belchertown providing an outlet for travel from Ware to Holyoke, Northampton and Amherst. It was apparent to the Commission that these roads as well as many dirt roads would have to be discontinued and in 1931 the Commission started its road construction program.

The Commission conferred with the county commissioners of Hampshire County and subsequently with the Department of Public Works and as a result of a written agreement signed by all parties thereto the location and plans for about 5.2 miles of bituminous macadam roads in the towns of Ware and Belchertown in Hampshire County including a concrete bridge over the Swift River was determined as the first necessary and practical substitute road to provide access to structures to be built and to allow certain roads to be closed as required by the program of construction.

By this agreement the highway was to be built to the specifications of the Department of Public Works, its construction entirely supervised by engineers of this Commission and the Department of Public Works agreeing to pay for the surfacing and guard rail for the same and to upon its completion accept and maintain it as part of the highway system of the Commonwealth.

This road was completed in 1932 at a total cost of \$225,707.19 of which the Department of Public Works by its agreement paid \$95,726.94 for the guard rail and surfacing and the Commission paid \$129,980.25.

The road was completed to the satisfaction of the Commission and accepted by them and in turn accepted by the Department of Public Works and is a portion of State Route #9 which is an alternate to state Route #20 and which extends from Boston to Pittsfield via Worcester, Ware, Amherst and Northampton.

Quabbin Park Cemetery, established by the Commission for the reinterment of the remains from Cemeteries in Quabbin Reservoir area, is adjacent to this highway as is the site of the Administration Buildings now under construction near the main dam of Quabbin Reservoir. The road not only has provided during the period of reservoir construction a direct route for traffic from Worcester and other points east of Worcester to Pittsfield, but has led the Department of Public Works to do further work on Route #9 which has made it a main artery of travel from New York State to Boston.

In 1933 the second project of road construction was started and under the same circumstances, namely, by written agreement with the county commissioners of Hampshire and Franklin Counties and with the Department of Public Works, the Commission laid out and constructed a bituminous macadam road in accordance with the specifications of the Department of Public Works from the junction of Route #9 in Belchertown through the town of Pelham in Hampshire County and New Salem in Franklin County to the Orange line, a total



distance of 20.8 miles of which 9.1 miles are in Hampshire County and 11.7 miles are in Franklin County.

Subsequently, this road was extended by the Department of Public Works through Orange to Athol where it joins the so-called Mohawk trail or Route #2 of the Commonwealth. This road known as the Daniel Shays Highway forms a part of the United States Route #202 which extends from Wilmington, Delaware to Bangor, Maine. This road has become very heavily traveled, especially in the summertime and in the fall, and as it skirts the western side of Quabbin Reservoir it not only is a through road but serves as a point of local interest to the Commonwealth because of the observation points which have been constructed at various points which permit an excellent opportunity to view the reservoir.

The total cost of this road is \$801,676.64 of which the Department of Public Works paid \$302,277.59 for the surfacing and guard rail while the Commission paid the balance of the cost at \$499,399.05.

In 1936, after conferring with the county commissioners of Franklin and Worcester Counties and with the Department of Public Works and reaching a written agreement with terms the same as the other agreements, the Commission laid out and constructed a highway in the towns of Petersham and New Salem a distance of 7.98 miles. This road, a bituminous macadam road built to the specifications of the Department of Public Works, is located 4.34 miles in Worcester County and 3.64 miles in Franklin County. The road extends from the junction of the Worcester-Athol Road in the town of Petersham westerly to the Daniel Shays Highway and it is the understanding of the Commission that the Department of Public Works will ultimately carry the road westward from the Daniel Shays Highway to the Mohawk trail or Route #2 of the Commonwealth. As in the case of Daniel Shays Highway the Department of Public Works will pay for the surfacing and the guard rail.

By the construction of this road which skirts the north end of Quabbin Reservoir, through traffic from Worcester and other towns in its vicinity as well as from the City of Boston coming over the Worcester Turnpike to Worcester are afforded a direct route to the Mohawk trail and one which by-passes the town of Petersham and towns of Athol and Orange. This program as above described was approved by the Commissioners of the three counties involved and has been accepted in writing by them in substitution of and in lieu of roads to be discontinued. The Department of Public Works has accepted these roads and their maintenance as part of the general highway system of the Commonwealth.

The Commission in 1936 also constructed about 1.8 miles of highway in the towns of Dana and Petersham of gravel surface mixed and placed with tar and thus completed a gap in a road from Hardwick Center to Petersham on the east side of Quabbin Reservoir, other portions of which were being constructed in a like manner by the town of Hardwick and the county of Worcester. The construction of this road was undertaken after an agreement had been reached by the county commissioners of Worcester as to the location and type of road required. The road was completed in 1936 and was constructed at a cost of \$63,840.60.

The program has provided on the west side of Quabbin Reservoir a standard highway for north and south traffic which has won approbation not only from the towns which it serves but the traveling public at large, and it has provided at the north and south ends of the reservoir east and west traffic roads of standard construction which gives direct connections to other main thoroughfares and by-pass local communities where traffic hazards were many as in Athol and Orange.

This road system has created a junction point at Belchertown for traffic which can divert to the western and southern parts of the Commonwealth and provides an outlet for through traffic to the state of Connecticut and other points south as well as New York and other points west, and it has also provided at Orange a junction point for the northerly and northwesterly parts of the Commonwealth and the states of Maine, New Hampshire and Vermont with direct connections to the Green and White Mountains.

Finally, the Commission has afforded protection to Quabbin Reservoir, for most of the road construction is without the drainage area but still near enough to allow the traveling public to view the major part of the reservoir and the major items of construction.



In addition, the Commission has submitted to the Council and has received its approval of a service road from a point in the town of Hardwick to Shaft #12 of Quabbin Reservoir. Surveys and plans for a road to give access for the public to and across the main dam and dike to an observation point on Mt. Quabbin are being made. This road in addition to giving the public a general view of the reservoir is of the utmost importance for fire protection and access to property and structures.

Respectfully, FRANK E. WINSOR, *Chief Engineer.*

VIII. SPECIAL INVESTIGATIONS

On November 3, 1937, His Excellency the Governor requested that the Commission employ an expert engineer not attached to the force of the Commission to pass on the economy and adequacy of the works constructed by the Commission and the desirability of the future projects proposed by the Commission. In compliance with the request of His Excellency the Commission on November 8 voted to employ Thaddeus Merriman, Consulting Engineer for the New York Board of Water Supply, the Metropolitan District of Southern California on the Aqueduct from the Colorado River to Los Angeles, on flood control plans in Los Angeles, California, Consulting Engineer of the Tennessee Valley Authorities, etc., to report on the following subjects:

“You will review the work already done and make such comment on its efficiency and economy as you may deem will be in the public interest.

Second, you will go over the plans for the completion of the work, estimates, etc., and determine upon their expediency and cost, and when the work should be done.

Third, you will also consider the future extensions of the Metropolitan Water System, in general covered by a special report to be made under Chapter 48 of the Resolves of 1936, which report is made in answer to a resolve of the Legislature, in regard to the desirability of by-passing the Sudbury Reservoir, distribution of the main supply by pressure tunnels, the necessity for sanitary protection, etc.

The Commission would like to have your report as soon as practicable, and will you kindly advise us how soon you can begin to work on this.”

As required by Chapter 48 of the Resolves of the Legislature for the year 1936, the Joint Board, consisting of the Commission and the Department of Public Health, continued its investigation relative to improvements in the distribution system and allied matters, particularly the possible construction of a pressure distribution tunnel from the Wachusett source of supply to the Metropolitan District. Contract 58 was awarded on March 23 to Pennsylvania Drilling Company, Pittsburgh, Pa., the lowest bidder, for making core borings in the counties of Middlesex, Norfolk, Suffolk and Worcester, in connection with this investigation. The work was completed at the end of the year. A report in accordance with the provisions of said resolve was prepared and filed in the manner and at the time prescribed.

IX. CEMETERIES

The Commission has continued the assignment of lots in the new Quabbin Park Cemetery and 1,598 bodies were removed from the Quabbin Reservoir area during the year, of which 1,522 were interred in Quabbin Park Cemetery. To date a total of 4,624 bodies have been removed from the Quabbin Reservoir area; of which 3,703 were interred in Quabbin Park Cemetery. There have been 28 original burials during the year in Quabbin Park Cemetery, making a total to date of 117 original burials in this cemetery.

In addition to cemeteries in which burials were discontinued by order of the Commission on August 25, 1932, further interments have been prohibited in the following cemeteries:

<i>Town</i>	<i>Cemetery</i>
Dana	Dana Center, Brown's Evergreen, Williams, Stone, Richardson, Hopkins.
Enfield	Packardsville, Packardsville Church.
New Salem	Golden Lake
Petersham	Snow

In addition, no further interments have been made in the Isaac Linzie Cemetery, Prescott, Mass.

Landscaping and maintenance of Quabbin Park Cemetery have been carried on during the year and studies made for the location and construction of a permanent service building.

#### X. FINANCIAL

The Commission appends hereto a statement of its expenditures and disbursements for the fiscal year, and from the date of its appointment.

#### XI. OTHER REPORTS

The report of the Chief Engineer is herewith presented.

#### XII. RECOMMENDATIONS

The Commission, having established its general taking line for the Quabbin Reservoir area, and the protection thereof, have determined that there will be so little left of the town of Dana which has not already been acquired by the Commission, or included within the general taking line, as to make impossible the future corporate existence of the town and suggest hereto an amendment, which accompanies this report, to Chapter 321 of the Acts of 1927 in substance providing for the ultimate annexation of portions of Prescott and Greenwich as well as the town of Dana to the town of Petersham in the county of Worcester.

Respectfully submitted,

E. C. HULTMAN, *Chairman*

THOMAS D. LAVELLE, *Associate Commissioner*

EDWARD J. KELLEY, *Associate Commissioner*

20 SOMERSET STREET, BOSTON, MASS.

January 15, 1938.

Draft of proposed legislation:

### THE COMMONWEALTH OF MASSACHUSETTS

In the year One Thousand Nine Hundred and Thirty-Seven

An Act providing that the town of Dana in the county of Worcester, and certain portions of the towns of Prescott and Greenwich in the County of Hampshire be annexed to the town of Petersham in the county of Worcester.

Be it enacted by the Senate and House of Representatives in General Court assembled, and by the authority of the same as follows:

SECTION 1. Chapter 321 of the Acts and Resolves of the year 1927 is hereby amended by striking out all of Section 13 and inserting therefor the following:

SECTION 13. Upon the expiration of thirty days from the recording of an order of taking as provided by section four of this act by which taking, together with previous purchases or takings as provided by said section four, of land in the towns of Dana, Enfield, Greenwich and Prescott, the whole or a substantial part of said towns is taken, and after notice thereof to the towns to be affected by annexation as hereinafter described in this section, the territory within the towns of Dana, Enfield, Greenwich and Prescott shall be annexed to the adjacent towns, and to the counties in which such adjacent towns are located in the following manner:

(a) There shall be annexed to the town of New Salem, and thereby to Franklin county, those portions of the towns of Prescott, Greenwich and Enfield, being portions of Hampshire county, bounded as follows: beginning at the intersection of the boundary lines of the towns of New Salem, Prescott and Shutes-



bury and following the existing channel of the west branch of the Swift river in a general southerly direction to its confluence with the Swift river; thence following the existing channel of the Swift river and its middle branch in a general northeasterly direction to the point where it is crossed by the boundary line between the towns of Prescott and Dana; thence following the boundary line between the towns of Prescott and Dana in a general northerly direction to its intersection with the boundary line of the town of New Salem; thence following the boundary line between the towns of New Salem and Prescott in a general westerly direction to the point of beginning.

(b) There shall be annexed to the town of Petersham, and thereby to Worcester County, all of the town of Dana, and those portions of the towns of Prescott and Greenwich, being portions of Hampshire county, bounded as follows: beginning at the point where the middle branch of the Swift river crosses the boundary line between the towns of Dana and Prescott and following the existing channel of said middle branch in a general southerly direction to its confluence with the east branch of said river; thence following the existing channel of said east branch in a general northeasterly direction to the boundary line between the towns of Greenwich and Hardwick; thence following the boundary line between the towns of Greenwich and Hardwick in a general northeasterly direction to its intersection with the boundary line of the town of Dana; thence following the boundary line between the towns of Dana and Greenwich in a general northerly direction to its intersection with the boundary line of the town of Prescott; thence following the boundary line between the towns of Dana and Prescott in a general northerly direction to the point of beginning.

(c) There shall be annexed to the town of Hardwick, and thereby to Worcester county, that portion of the town of Greenwich, being a portion of Hampshire county, bounded as follows: beginning at the most westerly corner stone on the boundary line between the towns of Hardwick and Greenwich located about two thirds of a mile southerly from the outlet of East pond; thence running due west to the existing channel of the east branch of the Swift river; thence following the existing channel of said east branch in a general northeasterly direction to its intersection with the boundary line between the towns of Hardwick and Greenwich; thence following said boundary line between the towns of Hardwick and Greenwich in a general southerly direction to the point of beginning.

(d) There shall be annexed to the town of Ware those portions of the towns of Greenwich and Enfield, all of said towns being in Hampshire county bounded as follows: beginning at the aforesaid most westerly corner stone on the boundary line between the towns of Hardwick and Greenwich located about two thirds of a mile southerly from the outlet of East pond; thence running due west to the existing channel of the east branch of the Swift river; thence following the existing channel of said east branch and of the Swift river in a general southwesterly direction to the intersection of the boundary line of the towns of Ware, Belchertown and Enfield; thence following the boundary line between the towns of Ware and Enfield in a general easterly direction to its intersection with the boundary line of the town of Hardwick; thence following the boundary line between the towns of Hardwick and Enfield in a general northerly direction to its intersection with the boundary line of the town of Greenwich; thence following the boundary line between the towns of Hardwick and Greenwich in a general northerly direction to the point of beginning.

(e) There shall be annexed to the town of Belchertown that portion of the town of Enfield, both of said towns being in Hampshire county, bounded as follows: beginning at the intersection of the boundary lines of the towns of Belchertown, Pelham and Enfield; thence running due east to the existing channel of the west branch of the Swift river; thence following the existing channel of said west branch and of the Swift river in a general southerly direction to the boundary line between the towns of Belchertown and Enfield; thence following the boundary line between the towns of Belchertown and Enfield in a general northwesterly direction to the point of beginning.

(f) There shall be annexed to the town of Pelham that portion of the town of Enfield, both of said towns being in Hampshire county, bounded as follows: beginning at the intersection of the boundary lines of the towns of Belchertown,



Pelham and Enfield, thence running due east to the existing channel of the west branch of the Swift river; thence following the existing channel of said west branch in a general northerly direction to the intersection of the boundary lines of the towns of Prescott, Pelham and Enfield; thence following the boundary line between the towns of Pelham and Enfield in a westerly and southerly direction to the point of beginning.

SECTION 2. Section 14 of said Chapter 321 is hereby amended by adding the word "Dana," before the word Enfield in the second, tenth, twentieth, twenty-ninth and forty-third lines of said Section 14, and substituting the word "four" for the word "three" in the fifteenth line of said Section 14, and by substituting the word "Petersham" for "Dana" in the twenty-third line in said Section 14, so as to read as follows:

SECTION 14. All the property belonging to the towns of Dana, Enfield, Greenwich and Prescott, shall upon the annexation of said towns to adjacent towns by authority of this act, vest in and become the property of the commonwealth for the benefit of the metropolitan water district, and the commonwealth shall succeed to all the rights, claims and causes of action of each of said towns, and shall assume and be liable for all the debts, obligations, trusts, duties and liabilities of each of said towns. All actions and causes of actions by or against the said towns of Dana, Enfield, Greenwich and Prescott pending or accrued, when such annexation takes effect, shall survive, and may be prosecuted to final judgment and execution by or against the commonwealth. All books, papers, monies and other property in the possession of the treasurer of each of these four towns or of any town officer thereof shall be turned over to the commission at the time of said annexation, and the commission shall wind up and liquidate the affairs of each such town as speedily as possible. Upon the final liquidation of the affairs of each the towns of Dana, Enfield, Greenwich and Prescott, the commission shall turn over such of the records of said towns respectively as are of permanent value to the towns of Belchertown, Petersham and New Salem, respectively, and said records shall be preserved with the records of the town to which they have been so turned over.

Upon such annexation the division of accounts of the department of corporations and taxation shall audit the books and accounts of the collector of taxes of each of the towns of Dana, Enfield, Greenwich and Prescott, respectively, and all taxes assessed for the year of such annexation and remaining uncollected, except taxes assessed upon property acquired by the commission under the second paragraph of section four of this act, to persons residing or property located within the territory annexed to another town shall be, by the assessors of the town in which such taxes were assessed, committed to the collector of taxes of the town to which such territory is by the provisions of this act annexed. It shall be the duty of any collector of taxes to whom any such taxes are committed to complete the collection of such taxes with legal interest and costs and pay over the same to the treasurer of the town for which he is the collector.

Upon the annexation to adjacent towns of the territory within the towns of Dana, Enfield, Greenwich and Prescott as set forth in this act, the commission or the metropolitan district commission shall yearly in the month of November reimburse each of said adjacent towns for all money paid out or expenses incurred under the laws of the commonwealth for the year preceding in the relief or aid of persons whose settlement was gained in whole or in part whether by original acquisition or derivation within the territory annexed to each of said towns respectively prior to the date of such annexation.

SECTION 3. Section 15 of said Chapter 321 is hereby amended by adding the word "Dana," before the word Enfield in the thirteenth line of said Section 15, so as to read as follows:

SECTION 15. Annexation under this act shall constitute the annexed territory part of the town and the county to which it is annexed with respect to the jurisdiction of the courts, as well as for all other purposes. All suits, proceedings, complaints and prosecutions, and all matters of probate, which shall be pending at the time of such annexation before any court or trial justice, or such matters as may be incident thereto, may however be heard and determined and prosecuted to final judgment and execution before such court or justice as if said annexation

had not taken place; but upon such annexation taking place, the several courts and trial justices having jurisdiction over the respective towns to which the territory within said towns of Dana, Enfield, Greenwich and Prescott is annexed shall have jurisdiction of all civil actions, matters of probate and insolvency and criminal prosecutions thereafter begun, although the cause of action has accrued, or crime, offense or misdemeanor has been committed, before such annexation, in the same manner and to the same extent as if such territory had been annexed prior to the accrual of the cause of action or the commission of the crime, offense or misdemeanor.

SECTION 4. Section 16 of said Chapter 321 is hereby amended by adding the word "Dana," before Enfield in the first line of said Section 16, so as to read as follows:

SECTION 16. An inhabitant of the town of Dana, Enfield, Greenwich or Prescott, when annexed to an adjacent town by authority of this act, who remains upon the annexed territory, or who removes to a place within the limits of the town to which the land upon which he resided has been annexed, as such limits existed prior to such annexation, shall have the same right to vote at a town meeting in such town, or at an election of town officers, that he would have had if the annexed territory had constituted a part of said town for six months prior to such meeting or election.

SECTION 5. Section 17 of said Chapter 321 is hereby amended by adding the word "Dana," before the word Enfield in the second line of said Section 17, so as to read as follows:

SECTION 17. During any interval between the annexation of said towns of Dana, Enfield, Greenwich and Prescott and the taking possession of the land taken therein by the commission under this act, the commission shall maintain the public ways, public schools and other public works and public institutions in said towns to such extent and in such manner as the commission may deem necessary for the convenience, comfort and welfare of the inhabitants remaining therein.

SECTION 6. Section 20 of said Chapter 321 is hereby amended by adding the word "Dana," before Enfield in the eighteenth and twenty-fourth lines of said Section 20, so as to read as follows:

SECTION 20. The provisions of sections six and seven of Chapter fifty-nine of the General Laws shall be applicable to land acquired in fee by the commission under this act for reservoir purposes or for the protection of the reservoir except to land within the present limits of the towns of Enfield, Greenwich and Prescott. On the land in these three named towns acquired previous to the date of their annexation, the Commission shall pay to each said town in which the respective land is located until such time as the annexation of said town, as provided in section thirteen of this act, a sum in lieu of taxes computed and paid as provided in said sections six and seven of said chapter fifty-nine, but including for this period the buildings and structures thereon. Subsequent to said annexation neither the commission nor the metropolitan district commission shall pay any taxes or make any payments in lieu of taxes on land or buildings within the present limits of the said towns of Dana, Enfield, Greenwich and Prescott.

As full compensation for any loss of taxation or any other loss caused by the carrying out of the provisions of this act, the commission shall pay the county of Hampshire the sum of fifty-five thousand dollars, which sum shall be paid at the time of the annexation of the towns of Dana, Enfield, Greenwich and Prescott to adjacent towns.



REPORT OF THE CHIEF ENGINEER

To the Metropolitan District Water Supply Commission.

GENTLEMEN:—The following is a report of the engineering department for the year ending November 30, 1937.

ORGANIZATION

On account of the completion, early in the year, of the Quabbin Reservoir clearing project, the engineering organization has, notwithstanding the requirements for handling the work of special investigations and sanitary surveys necessitated by Chapter 48 of the Resolves of 1936, been decreased during the year about 12 per cent.

Karl R. Kennison, Assistant Chief Engineer, continued in charge of all studies in connection with the general plan of the work and the design of structures, preparation of contract specifications, contract and working drawings.

Charles L. Coburn and Stanley M. Dore, Associate Civil Engineers, continued their general supervision of the detailed work of the office, and Walter H. Sears, Mechanical Engineer, continued in charge of the collection of data in connection with mill and water power damages. They have assisted in the preparation of contract specifications. William W. Peabody, Division Engineer, continued in charge of the Quabbin Reservoir and Aqueduct Division.

Charles T. Main, consulting engineer of Boston, Thaddeus Merriman, consulting engineer of New York, and other experts were employed from time to time. Illness prevented Dr. Charles P. Berkey, geologist of Columbia University from continuing his services as a consultant. Warren J. Mead, geologist of Massachusetts Institute of Technology was employed as a consultant on problems in connection with the special investigation of a deep pressure tunnel to improve the distribution system.

The assignment of employees under the direction of the Chief Engineer at the end of the year and of the preceding year was as follows:

	Nov. 30, 1936	Nov. 30, 1937
Headquarters Office, Designing Division . . . . .	44	52
Coldbrook Office, Quabbin Reservoir and Aqueduct Div. . . . .	34	11
Enfield Office, Quabbin Reservoir and Aqueduct Div. . . . .	93	88
Total Engineering Force . . . . .	171	151

The maximum force during the year was 171, during the week ending December 5, 1936. The minimum force was 147, during the week ending March 20. The average force for the year was 157.

OFFICES

The office of the Chief Engineer and Designing Division was continued in the Metropolitan District Commission Building at 20 Somerset Street, Boston. The offices of the Quabbin Reservoir and Aqueduct Division in the Ware River intake building in Coldbrook and in the property of the Commonwealth formerly known as the Frances W. Chandler house on Quabbin Road in Enfield, were continued throughout the year. Branch offices were maintained at other locations where work under important contracts was in progress. The laboratories for water analysis and for soil testing were continued in the property of the Commonwealth formerly known as the Barlow house, in Enfield. The branch office for handling the Quabbin Reservoir clearing project in Enfield was discontinued January 22.

HEADQUARTERS OFFICE

Summary of the Year's Work

Real Estate.—Reports and recommendations with respect to the purchase of real estate for the Quabbin Reservoir and its sanitary protection were submitted to the Commission during the year covering 2,843 acres, making a total reported on to date of 84,531 acres.



## PROGRESS OF REAL ESTATE PURCHASES FOR QUABBIN RESERVOIR

	Title Vested in Commonwealth (Acres)
Total for year ending Nov. 30, 1937 . . . . .	2,376
Total to Nov. 30, 1936 . . . . .	67,415
Total to Nov. 30, 1937 . . . . .	69,791

Options outstanding Nov. 30, 1937, include 455 acres.

Reports and recommendations with respect to the purchase of real estate for sanitary protection in the Ware River watershed above the intake works at Coldbrook were submitted to the Commission during the year covering 5,332 acres, making a total reported on to date of 21,280 acres.

## PROGRESS OF REAL ESTATE PURCHASES FOR WARE RIVER WATERSHED PROTECTION

	Title Vested in Commonwealth (Acres)
Total for year ending Nov. 30, 1937 . . . . .	3,274
Total to Nov. 30, 1936 . . . . .	10,575
Total to Nov. 30, 1937 . . . . .	13,849

Options outstanding Nov. 30, 1937, include 1,016 acres.

Real estate taking plans were prepared and filed during the year as shown in the appended table.

*Water Diversion Damage Claims.*—Data were prepared for the use of the attorneys in water diversion cases before the courts.

*Contracts and Specifications.*—Plans and specifications were completed for Contract 56, for constructing the administration buildings at the main dam of Quabbin Reservoir in the Town of Belchertown. The contract was executed July 28.

Plans and specifications were prepared for Contract 58, for making core borings in the counties of Middlesex, Norfolk, Suffolk and Worcester, in connection with the special investigation required by Chapter 48 of the Resolves of 1936. The contract was executed March 30.

Specifications were prepared for Contract 59, for drilling a well for the water supply of the administration buildings in the Town of Belchertown. The contract was executed March 30.

Plans and specifications were prepared for Contract 60, for constructing access roads to Shaft 12 of the Quabbin Aqueduct in the towns of Hardwick and Greenwich. The contract was advertised November 13 for opening of bids on December 2, 1937.

Working drawings for Contracts 50, 52 and 56 were prepared and issued.

*Inspection and Tests.*—E. L. Conwell and Company continued the testing of cement. The Worcester Polytechnic Laboratory continued the testing of concrete cylinders furnished under Contracts 52 and 56. Structural and reinforcing steel furnished under Contract 56 and stone for use on Contract 60 were inspected and tested by the New England Inspection Bureau of Cambridge, Mass. Stone for use on Contract 56, and iron and steel stop shutters, racks and lifters purchased for installation in the Swift River intake works at Shaft 12 and in the release control works at the main dam were inspected by the engineering force.

*Hydrographic Data.*—The gaging station on the Ware River at Coldbrook was continued in cooperation with the U. S. Geological Survey.

With the cooperation of the Enfield office, a study was made of methods of determining future releases from Quabbin Reservoir by observations of the flow of the Connecticut River, in order to satisfy the requirements of the U. S. War Department.

The gaging station on the Chicopee River at the United Electric Light Company plant at Bircham Bend was continued in cooperation with that company and the U. S. Geological Survey.

The gaging station on the Swift River above the intake to the stream control tunnel at the main dam was continued.

Cooperation with the United States Geological Survey in the operation and maintenance of the gaging station on the Swift River near the outlet of Pottapaug Pond in Hardwick and on the Connecticut River at Thompsonville, Connecticut, was continued.

Examination of the waters of the Ware, Swift and Chicopee rivers included analyses of samples taken at many places and observations of flow at additional temporary gaging stations, in order to obtain data for use in the defense of claims against the Commonwealth for damages due to diversion of water from these rivers.

#### *Ware River Diversion*

Ware River water was diverted into Wachusett Reservoir December 12 to January 9, inclusive. No water was diverted between May 31 and December 1. At other times, although the daily flow in the river was sufficient to permit diversion, no diversion except as above stated was made because of the present inadequacy of storage capacity in the reservoirs of the District. The quantity of water diverted during the year was 4,551,700,000 gallons. The steel bulkhead and gates, about 2,200 feet west of Shaft 8, prevent any flow of the Ware River westerly during diversion. This bulkhead will be removed upon the completion of Quabbin Reservoir.

#### *Sewage Diversion from Ware River Watershed*

The Rutland-Holden sewer continued in operation. During the fiscal year of the City of Worcester which includes the 12 months ending December 31, 1937, 51,597,000 gallons of sewage were discharged into the sewerage system of the City of Worcester, of which 29,916,000 gallons came from the U. S. Veterans Hospital.

#### *Investigation of Distribution System*

Work was continued in accordance with the requirements of Chapter 48 of the Resolves of 1936, relative to improving the distribution of water and more adequately preventing pollution of the sources of water supply of the Metropolitan Water District.

*Distribution System.*—Studies were made of the adequacy of the distribution system of the Metropolitan Water District and of the systems of the cities and towns in the District, of the present and anticipated water consumption requirements, of the feasibility of constructing a pressure aqueduct to deliver water to the District by gravity from the Wachusett Aqueduct Terminal Chamber, of the possibility of eliminating pumping at the Chestnut Hill and Spot Pond pumping stations, and of the cost of pressure tunnels and other types of pressure aqueduct.

*Surveys of Aqueduct Lines.*—Investigations and field surveys were made to determine the location of shafts for the construction of a pressure distribution tunnel, of a cut- and-cover pressure aqueduct and of new high-service distributing reservoirs.

*Contract 58.*—Bids were opened March 18, for making core borings in the counties of Middlesex, Norfolk, Suffolk and Worcester. Six bids were received, ranging from \$52,950.00 to \$116,930.00, two from contractors in New York State, three in Pennsylvania and one in Minnesota. The contract was executed March 30 with the Pennsylvania Drilling Company, Pittsburgh, Pa., the low bidder. Under this contract, 76 borings were made along the line of the proposed pressure tunnel, particularly where the depth to bedrock and its character could not be determined from surface outcrops. Work was started with the drilling of the first hole April 12 and was practically completed at the end of the year, the last hole being actually completed December 3, 1937.

The value of work included in contract estimates to November 15, the date of the latest estimate was \$49,771.11, of which 90 per cent was approved for payment. The contractor worked in mixed shifts and his total force averaged 18 men for a period of 33 weeks.

The principal items of plant were as follows:

- 3 Churn drills
- 4 Light tripod drills
- 9 Core drills

The total work done under the items of Contract 58 is as follows:

Borings in earth . . . . .	7,195 lin. ft.
Borings in bedrock and boulders . . . . .	10,420 " "
Satisfactory rock core recovered (as measured for payment) . . . . .	9,590 " "



*Sanitary Surveys of Watersheds.*—Sanitary surveys were made of the Sudbury, Wachusett, Ware and Swift watersheds. Data for this purpose were obtained from the Metropolitan District Commission and the Department of Public Health. The field surveys were started May 14. Samples were taken and bacteriological examinations were made of numerous points on the watersheds. Methods of disposal of sewage and wastes from manufacturing plants and private premises on the watershed were examined. Maps showing all features of the occupation of all the watersheds were made, one including the North Sudbury watershed, one including the South Sudbury watershed, one including the principal areas in the vicinity of Wachusett Reservoir, all on a scale of 1 inch = 800 feet, and one showing the Swift, Ware and Wachusett watersheds on a scale of 1 inch = 2000 feet. All industrial plants and private premises on the watershed were examined.

*Aerial Photographs and Maps.*—In connection with this investigation, an aerial survey was made of the entire Sudbury, Wachusett, Ware and Swift watersheds, scale 1 inch = about 800 feet, and a mosaic map prepared consisting of 40 sheets, each approximately 26 by 38 inches and each covering an area approximately 3.64 by 5.46 miles. The photographs were taken by the 101st Photo Section, 26th Division Air Service, Massachusetts National Guard.

### *Design of Structures*

*Shaft 1. Wachusett Outlet.*—Studies were continued and designs made for the installation of gates to control the discharge from Quabbin Aqueduct into Wachusett Reservoir. Studies were made of the desirability of increasing the capacity of the electric hoist in the Wachusett outlet building from 5 to 7½ tons, for handling heavy equipment into and out of the deep dry well for unwatering the tunnel. A 7½-ton electric hoist was purchased and installed.

*Shaft 8.*—Studies and designs were made for a service building near the Ware River intake works. Studies were also made indicating the impracticability of any power development on the Ware River at the diversion dam.

*Shaft 9.*—Studies were completed for the requirements of an electric hoist to handle men and equipment in and out of the aqueduct at Shaft 9. The 5-ton hoist previously installed at Shaft 1 was found to be amply suited to this purpose and was installed in the head house at Shaft 9.

*Shaft 12.*—Designs were completed for stop shutters and lifters required for unwatering the tunnel and of one-way shutters to permit the drawing of water from Quabbin Reservoir into the tunnel or to prevent discharge into this reservoir of water diverted from the Ware River. These shutters and lifters were purchased. Studies were completed of the requirements of a 3-ton electric hoist operated by the 15-kilowatt, gasoline-driven generator in the service building, to handle these shutters, as well as men and other equipment in and out of the shaft. This hoist was purchased. Designs were made for grading and landscaping at the Swift River intake and service buildings at Shaft 12, in connection with an access road from a point in the existing highway extending westerly from Shaft 11A.

*Shallow Flowage.*—Studies were continued of the possibility of eliminating two areas of shallow flowage on the margins of Quabbin Reservoir by the construction of low dams to maintain the water level in such areas, when the main reservoir is drawn down.

*Main Dam and Dike Embankments.*—Studies were continued of the materials in the main dam and dike embankments as revealed by tests of samples taken periodically from the embankments, including samples from the observation wells in the interior of the impervious core, as a guide in the proper control of borrow pit materials used in the hydraulic sluicing.

*Administration Buildings and Boathouse.*—Studies were continued and designs completed for the permanent office and maintenance buildings near the site of the main dam. Studies and designs were made for a water supply system for these buildings, including a deep drilled well and motor-driven pump with a capacity of 30 gallons per minute against a head of 150 feet, located in the boathouse and hangar, and a 50,000 gallon underground concrete tank 27 feet



in diameter and 17.5 feet in maximum depth, located about 80 feet above the main floor of the administration building.

*Power Development at Main Dam.*—Studies were continued of the requirements of hydroelectric power development at the outlet works downstream from the stream control tunnel at the main dam, and designs were continued for these outlet works.

*Roads.*—Studies were completed of substitute highways around Quabbin Reservoir.

*Quinapoxet River Diversion.*—Studies were continued relative to diverting into the aqueduct at Shaft 2 the waters of the Quinapoxet River for storage in Quabbin Reservoir.

*Diversion of Industrial Wastes.*—Studies were continued of methods of diversion of objectionable wastes into the Rutland-Holden sewer constructed under Contract 39.

#### *Maintenance of Records*

*Photographic Records.*—The taking of moving pictures from time to time to illustrate the progress of the work was continued.

*Record Plans.*—Progress was made on the preparation of record plans of the Ware River intake works and Quabbin Aqueduct. Record plans were completed and filed, with the Department of Public Works, of the state highway, 5.2 miles long, in the towns of Ware and Belchertown, constructed under Contract 21, and of those portions of the Daniel Shays Highway so-called, 9.1 miles long, in the towns of Belchertown and Pelham, constructed under Contract 41, and 7.6 miles long, in the towns of Shutesbury and New Salem, constructed under Contract 43.

*Cemetery Records.*—Records of assignment of lots and interments in Quabbin Park Cemetery and of the general removal of bodies from existing cemeteries in the reservoir area were maintained.

*Cost Records.*—Assistance was given to the Secretary's office in the apportioning of costs and the preparation of financial statements.

*Inventories.*—Inventory records of tools and equipment in the Commission's offices and storehouses were kept up to date.

#### QUABBIN RESERVOIR AND AQUEDUCT DIVISION

The Quabbin Reservoir and Aqueduct Division, continued in charge of the work on the Ware River watershed, of the maintenance of the Rutland-Holden sewer, of the maintenance and operation of the Ware River intake works at Coldbrook and the Wachusett outlet works at West Boylston, of the construction of the East Branch Baffle, the buildings at the tops of Shafts 9 and 12 and of the field work in the Swift River valley in connection with the proposed Quabbin Reservoir, including topographic and real estate surveys, cemetery removals and reforestation, of the soil testing and water analysis laboratories, of the investigations, surveys, etc., along the Ware, Swift and Chicopee rivers, and of the construction of the main dam and dike embankment, relocated highways, and the group of administration buildings at the main dam.

#### *Miscellaneous Office Work*

Semi-monthly estimates for Contracts 50, 52 and 55, monthly estimates for Contracts 49, 51, 56 and 57, and final estimates for Contracts 38, 49, 51, 53, 54, 55, 57 and 59 were prepared. Additional real estate plans were prepared of miscellaneous properties in the Ware River watershed, final tracings being made of about 2,400 acres, making a total to date of about 6,750 acres. Record tracings of the plans showing the Ware River drainage divide were continued. A record topographic map was made of the vicinity of the Ware River intake works and work was continued on the making of topographic maps of miscellaneous swamp areas and ponds in the Ware River watershed and of other miscellaneous areas as required. Plans and studies were made of methods of disposing of sewage at various points in the Wachusett watershed and of making connections for the same into the Rutland-Holden sewer. Daily rainfall and temperature records and continuous records of the flow of the Ware River were

kept at the intake building. Daily rainfall records were kept at West Rutland. Daily rainfall and temperature records were kept at Enfield. Continuous records of the flow of the Swift River were kept at the main dam site. Work on the record plans and tracings of the Daniel Shays Highway between Belchertown and New Salem was continued. Photographs of the progress of construction were taken.

#### *Miscellaneous Field Work*

Lines and grades were given for construction under Contracts 47, 50, 51, 52, 55, 56, 57 and 59. Daily readings of the ground water level in numerous test wells were continued during construction operations at the main dam and dike. Morton Pond was used to supply the make-up lines for the sluicing operations at the dike until September 30, 1936. About January 8 the water level of Morton Pond at elevation 434.8 stood 17.8 feet above the original surface and the flow commenced northerly into the Swift River. Monthly inspections and reports were continued of conditions found at all shaft heads along the Quabbin Aqueduct.

The Department of Public Health continued its cooperation with this division in the analysis of samples of water. The chlorinator station on Mill Brook below the Central New England Sanatorium was maintained.

#### *Quabbin Aqueduct and Ware River Intake Works*

A new 7½-ton electric Monorail hoist, with a lift of 240 feet, was installed March 2 in the Wachusett outlet works at Shaft 1 to replace a 5-ton hoist of similar lift which was moved to the Shaft 9 head house and erected there April 17. A 3-ton electric hoist, with a lift of 140 feet, was installed in the Shaft 12 head house April 15.

The Ware River intake works were maintained ready for operation whenever required. The tunnel was entered for inspection through Shaft 8 on October 7.

#### *Operation of Rutland-Holden Sewer*

The Rutland-Holden sewer was in continuous operation. The meter stations at the Rutland State Sanatorium, at the U. S. Veterans Hospital in Rutland and at the Holden-Worcester boundary line were inspected regularly and weirs and piezometer connections cleaned and records of flow maintained. Starting April 14, monthly inspections were made by traversing the entire length of the line and inspecting the embankment structures, manhole covers, locks, etc. Necessary repairs were made.

#### *Ware River Watershed*

*Maintenance.*—A small labor force was employed throughout the year in caring for the grounds at the Ware River intake, Wachusett outlet and Shaft 4 and Shaft 9 head houses, setting stone bounds, filling cellar holes, grading and cleaning up at the sites of buildings removed from the Ware River watershed, reforestation and other miscellaneous work. The average number of men so employed was 9, the maximum being 24 during the week ending May 29.

*Reforestation.*—Reforestation in the Ware watershed was continued. Planting of transplants from the Commission's nurseries in the Swift River valley and from swampy areas within the flow line of the proposed Quabbin Reservoir was started April 21 and completed May 28. A total of about 280,000 4-year white pine and Norway spruce transplants and 1,400 black spruce and larch from swampy areas was planted in the general vicinity of Coldbrook and along the river upstream from the intake works.

*Fire Protection.*—Forest fire fighting equipment was housed in a building of the Commission near the intake works and was maintained in readiness for service at all times. The equipment and personnel responded during the year for one forest fire on land of the Commonwealth within the Ware River watershed, which burned over an area of less than one-quarter acre.

#### *Quabbin Reservoir*

*Topography.*—Taking of topography in the area below the flow line of the reservoir was continued. To date, 32,149 acres of 50.2 square miles have been surveyed for the general topographic maps within and adjacent to the proposed



reservoir, including the location of the entire flow line. A small labor force was employed in connection with this work.

*Real Estate.*—Properties described in applications by owners for sale of real estate were located and when no surveys had been made sketches showing the approximate location were prepared. Comprehensive real estate surveys and analyses and descriptions of deeds were continued. Real estate surveys during the year cover 4,522 acres, making a total to date of 68,786 acres or 107.5 square miles. Of this total, 68,000 acres have been plotted on a scale of 1 inch = 200 feet.

*Photography.*—The photographing of buildings, cemetery lots and construction was continued. During the year 63 photographs of buildings, 769 photographs of miscellaneous views and of the progress of construction at Quabbin Reservoir and elsewhere, and 134 photographs of property in the Ware River watershed were taken.

*Cemetery Removals.*—Interments in Quabbin Park Cemetery and the general removal of bodies from existing cemeteries in the reservoir area were continued. The removal of bodies, headstones and monuments has been done with labor engaged directly for this work. During the year work progressed as shown in the following table:

CEMETERY REMOVALS				
	To Nov. 30, 1936*	Year Ending Nov. 30, 1937	Total	
Burial lots in Quabbin Park Cemetery assigned in exchange	423	142	565	
Burial lots in Quabbin Park Cemetery sold . . . . .	22	6	28	
Number of releases executed of rights in old lots in Quabbin Reservoir area	} to Q. P. Cemetery to other cemeteries	386	142	528
		238	25	263
Bodies removed from Quabbin Reservoir area	} to Q. P. Cemetery to other cemeteries	2181	1522	3703
		845	76	921
Bodies moved from area outside Quabbin Reservoir to Quabbin Park Cemetery		3	—	3
Burials, not reinterments, in Q. P. Cemetery . . . . .		89	28	117
Headstones moved { to Q. P. Cemetery . . . . .	1252	885	2137	
{ to other cemeteries . . . . .	407	23	430	
Monuments moved { to Q. P. Cemetery . . . . .	216	81	297	
{ to other cemeteries . . . . .	139	9	148	

\*Includes corrections of previously reported data. Quabbin Park Cemetery was not completed for use until August 25, 1932, prior to which time 632 bodies had been removed to other cemeteries.

On July 30 a taking of Woodlawn Cemetery, Cemetery Hill Cemetery and Church Cemetery in Enfield, and on October 6 a taking of Greenwich Cemetery in Greenwich, was made.

The vault was maintained and used from time to time during the winter months. Work of developing Quabbin Park Cemetery was continued by grading and seeding miscellaneous areas outside the established lots and by miscellaneous clearing. Cemetery lots were graded and seeded as removals were completed and in the case of purchases were graded and seeded at once. The average force employed on cemetery work during the working season of about 35 weeks was 21 men, the maximum being 28 during the week ending September 25.

*Fire Protection.*—The fire-fighting equipment was maintained in readiness for service at all times. Assistants in the division office were reappointed as deputy forest wardens in the towns affected by the reservoir. The equipment and personnel responded during the year to calls for assistance at 9 forest fires which burned over a total area of about 246 acres. There also occurred a total of 12 fires in buildings, 7 of which were chimney fires resulting in little if any damage. A small labor force was employed to maintain a fire patrol throughout the year.

*Lumbering.*—Various lumbermen continued cutting operations under agreements with the Commission for the purchase of standing timber. In addition, miscellaneous small lots of standing timber have been sold and cut under the general supervision of this division.

*Reforestation.*—The general program of reforestation was continued with stock from the Commission's nurseries. Planting of 4-year-old white pine and red pine transplants was started April 23, and completed May 11, on approximately 200 acres of the middle and lower portions of the "Prescott Peninsula," and was confined to open areas requiring no clearing. A total of about 241,000 white pine



and 53,000 red pine transplants were planted in addition to stock transferred to and planted in the Ware River watershed, as hereinbefore mentioned.

The entire stock was removed from the Twible Farm Nursery and from the Smith Farm Nursery during the spring, for planting on the watersheds of Quabbin Reservoir and the Ware River and these nurseries were discontinued. This stock consisted of about 480,000 4-year white pine, 42,000 4-year Norway spruce and 53,000 4-year red pine transplants.

General maintenance work was done in the Thurston Farm Nursery. At the end of the growing season it was estimated that the following number of seedlings and transplants were growing in the beds in this nursery:

	Number of 2-year Seedlings	Number of 4-year Transplants
White Pine . . . . .	1,750,000	190,000
Red Pine . . . . .	1,900,000	270,000
White Spruce . . . . .	370,000	12,000
Red Spruce . . . . .	300,000	8,000
Norway Spruce . . . . .	350,000	40,000
European Larch . . . . .	200,000	....
Hemlock . . . . .	130,000	....
	<hr/> 5,000,000	<hr/> 520,000

General maintenance work was done in the Commission's permanent nursery in Belchertown, located above the future flow line of the reservoir near the main dam. The nursery work in this location consisted of plowing and harrowing and grading seed bed areas, constructing seed bed frames, planting, fertilizing, weeding, watering, applying of chemicals for the control of damping-off disease, and mulching and covering of seed beds for the winter. There are now 138 seed beds, 150 feet long by 4 feet wide, in this nursery. In addition, about 20 acres were prepared to receive the seedlings from the Thurston Nursery by harrowing, planting buckwheat, plowing under, harrowing and replanting. The following quantities of seed were planted both in the spring and in the fall, the latter being experimental, and it is estimated that the number of 1-year seedlings now growing in the seed beds in this nursery is as follows:

	Pounds of Seed in Spring	Pounds of Seed in Fall	Number of Seedlings
White Pine . . . . .	60	15	1,100,000
Red Pine . . . . .	55	20	1,200,000
White Spruce . . . . .	13	7	600,000
Red Spruce . . . . .	15	5	600,000
Norway Spruce . . . . .	15	5	500,000
European Larch . . . . .	35	15	500,000
Hemlock . . . . .			15,000
	<hr/> 193	<hr/> 67	<hr/> 4,515,000

Work was continued on the collecting from the reservoir area and the transplanting in the Belchertown nursery of hemlock, Norway spruce, ground juniper, azalea, red pine, mountain laurel and other shrubs and conifers. About 8,600 of such plants and shrubs are now on hand.

Gypsy moth control adjacent to areas planted to pine was continued. This work included the cutting of apple, gray birch and other species which are hosts of the gypsy moth, and creosoting of gypsy moth egg clusters. White pine blister and rust control was continued.

A labor force of about 12 was employed for about 40 weeks during the season of work in the nursery, on broad planting, gypsy moth and blister rust control and other reforestation work.

*Clearing Project.*—The work of clearing areas to be flooded by Quabbin Reservoir, which was started about May 1, 1936, as an unemployment relief project, was continued to completion on January 22. The tools and small equipment used on this project were then stored in the storehouse formerly occupied by the Haskell store in Enfield village. The number of men on the work averaged about 640 for the 8 weeks ending January 22, and was decreased from 938 to 279 before the work ended.

*Maintenance.*—A labor force was employed throughout the year in cleaning up debris from buildings removed and filling cellar holes, burning brush left by the clearing project and by lumber operations, cutting a 40-foot fire lane

around the proposed real estate taking line, recutting and burning brush which had grown up in areas cleared as a fire stop along the flow line in 1935, and miscellaneous work of maintenance. The average number of men so employed was 33, the maximum being 69 for the week ending March 27.

*Soil Testing Laboratory.*—The work of exploring, collecting and testing materials to be used in the construction of the main dam and dike, together with current control tests of the quality of the material placed in these structures, was continued. New equipment was added to the laboratory from time to time as testing methods were expanded. Tests were principally of the permeability, stability and related characteristics of soils affecting their use in hydraulic-fill and rolled-fill embankments. Use of the plasticity needle was continued. Samples from selected borrow areas were collected as required for preliminary testing to determine their suitability for use in the embankments.

Size distribution analyses supplemented by tests of permeability, density and moisture content were used in the control of materials placed in the rolled pervious and impervious fills used to top off the dike embankment.

Size distribution analyses supplemented by permeability and porosity tests were used for the routine control of the quality of the beach and core materials placed by the full-hydraulic method in the construction of the main dam embankment. Fins of unsuitable material projecting into the core were jetted. Samples were collected daily from the dry-box hopper for sizing tests. The water in the central pool was examined daily for turbidity. Samples from the settled core were obtained periodically through the ports of the two observation wells and tested for size gradation and porosity to determine the extent of consolidation. Methods and equipment were developed to test 100 samples per day for grain-size distribution, in order to keep pace with the sampling schedule used in the construction of the main dam hydraulic embankment.

Grading and moisture tests were made of concrete aggregates and slump tests were made on concrete samples. Miscellaneous testing included materials used in the embankment of the East Branch Baffle in Greenwich. During the year, 9,862 samples were collected, and 10,653 samples, including some collected during the previous year, were tested. A small labor force was employed in the collecting and handling of samples.

*Chemical and Bacteriological Laboratory.*—The sampling and bacteriological examination of water supplies of the Commission's contractors and of miscellaneous supplies on property controlled by the Commission were continued.

Regular samples have been collected and sampled from stations on the Ware, Swift, Quaboag and Chicopee rivers. Supervision of the water supplies for the reservoir clearing project was continued until the completion of this project. Samples were taken to determine the quality of water to be supplied from the deep well sunk under Contract 59 for the group of administration buildings at the main dam. In connection with the comprehensive sanitary survey of the watersheds of the Metropolitan District, under Chapter 48 of the Resolves of 1936, a program of sampling the rivers and their tributaries in the Wachusett and Sudbury watersheds was carried on. Fifty-seven sampling stations were established for this purpose and on several of the more important tributaries weirs were installed and the flow recorded at the time of sampling. A small labor force was employed in the collecting and handling of samples.

### *Progress of Contracts*

*Contract 38.*—Contract 38, with The Two Companies, Inc., for constructing a core wall to sound rock at the site of the main dam of Quabbin Reservoir in the towns of Belchertown, Enfield and Ware, was completed January 9.

The value of work included in contract estimates during the year was \$38,-854.65, the final estimate dated August 5 being for \$1,606,629.88.

*Contract 47.*—Contract 47, with Vincent Cairn, for constructing the service building and the head house at Shaft 12 of Quabbin Aqueduct in the Town of Greenwich, was continued. At the beginning of the year the work was about 80 per cent completed. The contractor continued through the winter to March 3



and resumed operations the second week in April. At the end of the year work on this contract was practically completed.

The value of work included in contract estimates during the year was \$7,522.85, or a total to August 2, the date of the latest estimate, of \$34,640.10, of which 90 per cent was approved for payment. The contractor's force averaged 3 men over a period of 20 weeks, the maximum being 10 for the week ending December 12, 1936.

*Contract 49.*—Contract 49, with Cenedella & Co., for excavating diversion channels at the site of Quabbin Reservoir in the towns of Dana, Hardwick and Greenwich, was completed July 22.

The value of work included in contract estimates during the year was \$2,591.68, or a total to June 11, the date of the latest estimate, of \$87,358.00, of which \$84,789.69 was approved for payment. Following completion of the work a final estimate was prepared but settlement has not yet been made.

*Contract 50.*—Contract 50, with the Arthur A. Johnson Corporation, for constructing the embankment of the dike of Quabbin Reservoir in the towns of Enfield and Ware, was continued and at the end of the year was practically completed except for cleaning up the borrow pits. The rolled fill topping off the embankment was discontinued from December 3 to April 7, on account of frost, and was completed May 15.

During the winter months the work of placing the light and heavy riprap was carried on. About 30,000 cubic yards of light riprap and 20,000 cubic yards of heavy riprap were placed. All the riprap was secured from the borrow pits where the stones had been set aside during the previous excavations for the material for the hydraulic fill. The downstream face of the embankment and highway slopes were graded, covered with 6 inches to one foot of topsoil and seeded. Gravel sub-base was placed on the roadway at the top of the embankment and in the east and west access roads. These roads were surfaced with rolled trap rock and bound with bituminous materials. Cable and boulder guard rail was placed along the access roads. Paved grouted gutters were constructed where needed along the access roads and a paved grouted curb was built along the roadway on top of the embankment. Stone walls laid in mortar were built on both sides of the roadway on top of the embankment and around both of the access circles at the ends.

The drainage system consisting of tile pipes and catch basins was completed. The 3-foot vertical steel-cylinder shaft with observation ports above caisson 13 was brought to about 15 feet below the top of the embankment into a concrete chamber which extends up to a manhole cover on the north side of the road. Two large boulder monuments were placed at the center of the east and west access circles. Work on this contract was practically completed at the end of the year.

The value of work included in contract estimates during the year was \$208,353.71, or a total to November 15, the date of the latest estimate, of \$1,373,002.41, of which \$1,360,702.17 has been approved for payment. The contractor's force averaged 57 men throughout the year, the maximum being 123 for the week ending December 5, 1936.

The total electric energy used by the contractor during the year was 112,500 kilowatt hours, making a total of 4,722,600 kilowatt hours to date.

The only important items of plant added during the year were one stone spreader and one 10-ton gasoline roller.

The total work done and the materials furnished to date under the principal items of Contract 50 are as follows:

Clearing and grubbing . . . . .	136 acres
Earth excavation . . . . .	74,000 cu. yds.
Rock excavation for core walls . . . . .	8,200 " "
Rock excavation except for core wall . . . . .	3,250 " "
Consolidated pervious foundation embankment . . . . .	176,500 " "
Rolled impervious embankment in core . . . . .	49,950 " "
Rolled impervious embankment except in core . . . . .	75,070 " "
Embankment by full-hydraulic method . . . . .	2,024,000 " "
Miscellaneous embankment . . . . .	33,000 " "
Selected coarse material . . . . .	71,160 " "
Crushed stone or screened gravel . . . . .	21,800 " "
Light riprap . . . . .	85,500 " "
Heavy riprap . . . . .	20,400 " "



## DIKE OF QUABBIN RESERVOIR

Length, 2140 feet.

Maximum height above ground, 135 feet.

Maximum height above rock, 264 feet.

Width of top, 35 feet.

Maximum thickness at base, 850 feet.

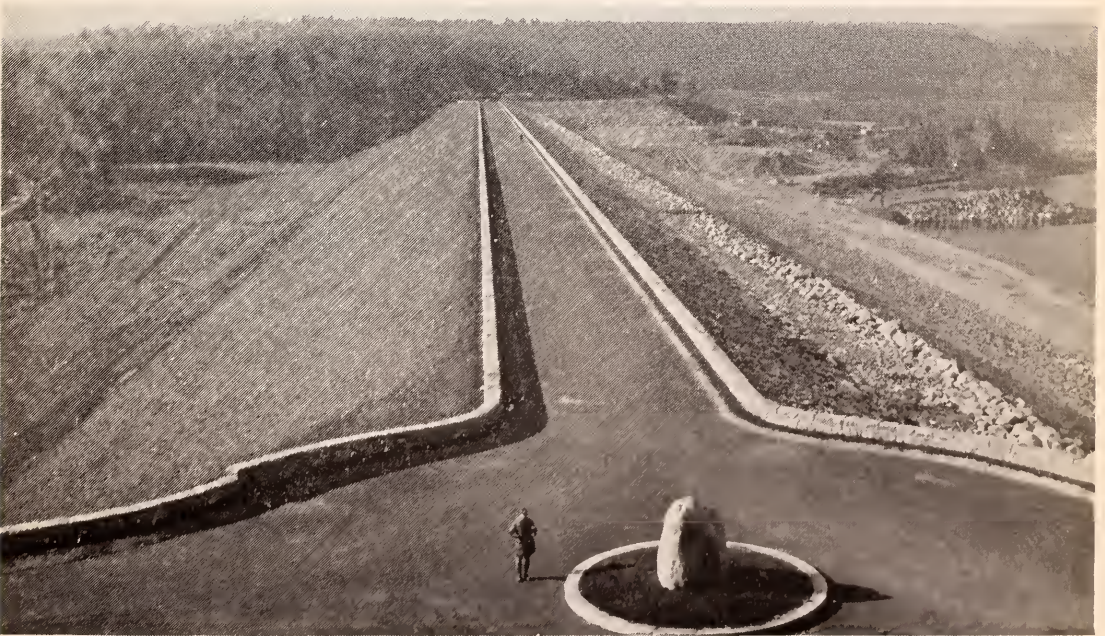
Maximum depth of water, 115 feet.

Embankment 2,500,000 cubic yards.

Completed December, 1937.



CONTRACT 50—Downstream Face Looking Northerly from East Access Road.



CONTRACT 50—Roadway Across Top Looking Westerly from East End.





Paving . . . . .	780	"	"
Soil dressing . . . . .	38,000	"	"
Seeding and grassing . . . . .	29	acres	
Gravel sub-base for roads . . . . .	4,600	cu. yds.	
Broken stone base for roads . . . . .	1,820	"	"
Broken stone surface for roads . . . . .	2,880	tons	
Bituminous material . . . . .	39,290	gallons	
Cable guard rail . . . . .	1,950	lin. ft.	
Boulder guard rail . . . . .	1,350	"	"
Stone walls . . . . .	1,090	cu. yds.	
Furnishing and placing grout . . . . .	635	"	"
Portland cement . . . . .	11,070	bbls	
Concrete, Class A . . . . .	4,830	cu. yds.	
Concrete, Class B. . . . .	15	"	"
Miscellaneous steel and iron . . . . .	58,800	lbs.	
12-inch, 18-inch and 24-inch tile pipe . . . . .	5,220	lin. ft.	

*Contract 51.*—Contract 51, with Franklin A. Snow Company, for constructing the East Branch Baffle across the East Branch of Quabbin Reservoir in the towns of Greenwich and Hardwick, was continued to completion. Work was continued on the placing of the upper 6 feet of pervious fill, which was completed February 15. The pervious material was spread by bulldozers, watered by hose lines and consolidated by tractor-drawn sheep's foot rollers. The screening plant for screened gravel was operated until January 12. The placing of screened gravel on the pervious fill was completed February 13. Riprap was dumped from trucks. Quarry operations for the riprap were continued until February 15. Concrete work in the control chamber of the conduit through the baffle was completed December 20, 1936.

The auxiliary south baffle was completed in a manner similar to that described above, placing of pervious fill being completed December 29, screened gravel January 4, and riprap February 2. All work was shut down February 20 and resumed April 26. The Hardwick-Greenwich road relocated during the previous year was regraded and completed between April 26 and May 3. The entire construction work was completed June 11.

The value of work included in contract estimates during the year was \$34,634.48, the final estimate dated July 21, being for \$199,045.99. \$9,500.00 of this amount is holding pending the outcome of contractor's petition. The contractor's force averaged 22 men over a period of 26 weeks and the maximum was 76 for the two weeks ending February 13.

No important items of plant were added during the year.

The total work done and materials furnished under the principal items of Contract 51 are as follows:

Earth excavation . . . . .	40,173	cu. yds.
Pervious embankment . . . . .	412,130	" "
Impervious embankment . . . . .	8,585	" "
Stone fill . . . . .	8,936	" "
Riprap . . . . .	39,757	" "
Screened gravel . . . . .	28,415	" "
Concrete . . . . .	902	" "
Portland cement . . . . .	1,784	bbls.

*Contract 52.*—Contract 52, with Benjamin Foster Company, for constructing the embankment of the main dam of Quabbin Reservoir in the towns of Belcher-town, Enfield and Ware, was continued throughout the year. In the concrete blanket on the east abutment, poured last year, the contractor drilled grout holes in February and in April grouted them and drilled and grouted the test holes, completing this abutment on April 28, 63 cubic yards of grout being placed. Work on the west abutment was resumed April 5 and drilling and grouting started in the lower portion. Starting May 14, the concrete blanket was extended up the abutment. The mixer was moved to progressively higher positions along the upstream side of the cut, and timber trestles built, over which the concrete was transported to the forms in buggies. The blanket was completed on August 30, 1657 cubic yards being placed this year, making a total of 2469 cubic yards. Grouting of this abutment was completed October 5, 860 cubic yards being placed.

The construction and grading of the beaches in preparation for the hydraulic fill was suspended for the winter on December 2, and completed the latter part of April. A total of 17,500 cubic yards was placed in the foundation beaches under this contract. In April the lower sections of two steel observation wells



similar to the one built in the dike under Contract 50 were concreted into the center wells of caissons 7 and 20, and a sampling port was drilled through the concrete in the upstream face of caisson 7.

The core pool was filled and the pump barge floated at elevation 412 on May 15. Placing of the hydraulic fill was started May 19. The pool level was maintained by a battery of 4 make-up pumps, 60 to 200 horsepower, located on the river upstream from the dam and discharging through a 16-inch water line into a floating stilling box close to the west abutment. On the pump barge a battery of four 12-inch, 350 horsepower pumps pumped water from the pool through a 28-inch pipe to a hog box at about elevation 645 on the top of the hill at the east abutment. In the hog box the water from the pool and the dry-fill material, coming by conveyor from the borrow pits as hereinafter described, were mixed and flowed by gravity through the sluice pipes to the outer edges of the upstream and downstream beaches. The point of discharge from the pipe was varied by adding or removing lengths of pipe so that each beach was built up successively over its whole length. The coarse material was deposited nearest the pipe and the finer materials carried further down the beach by the water while the finest or core material was carried into the pool in suspension and was there settled out.

A 1-cu. yd. dragline on each beach shaped up the outside slopes of the fill as the material was deposited and made the blanket of selected coarse material required on the upstream face by picking up the coarser materials at the end of the sluice pipe. These draglines were also used in adding and taking off lengths of sluice pipe.

The method of construction at the main dam differed from that at the dike in two important respects: (1) Thin steel sluicing pipes lined with rubber one-half inch thick were used instead of ordinary steel pipes. These pipes were 20 inches in diameter and were furnished in 5, 10 and 20-foot lengths. They were joined together by flanges slotted for convenience in bolting, and faced with rubber continuous with the pipe lining. This pipe was designed for long life as compared with plain steel pipe. (2) Eight belt conveyors were used instead of trucks to carry material from the borrow-pit cuts to the hog box.

The original plan was to use sluice lines of the rubber-lined pipe with windows spaced about 25 feet apart for distributing the material the length of the beach without dismantling the pipe. This did not work out satisfactorily and the use of windows was abandoned, and the material distributed by successively adding or taking off pipe. It was also the original intention to deliver on both beaches at once but it was found that except under unusual circumstances one pipe would carry the capacity of the main belt conveyor, and the beaches were built alternately.

The operations were carried on during May with one shift, and after June 1 with 3 shifts, and 6 days a week except for necessary shutdowns for repairs.

Material for the hydraulic fill was obtained principally from a low-level borrow pit upstream from the dam east of the river in the vicinity of the old highway, supplemented as required by material with a higher percentage of fines from a higher pit further east. A dry box was constructed between these two pits at the foot of the hill forming the east abutment of the dam. The main conveyor running up hill from the dry box to the hog box consisted of 3 sections of 42-inch belt with a 150-horsepower motor on each and a total length of 855 feet. At first only this main conveyor and dry box at its lower end were used. Boulders were rejected at the dry box and trucked to stock piles for future use as riprap. Stones larger than about 6 inches which passed through the dry box were picked off the belt conveyor by hand. Operations in the lower borrow pit by tractor drawn scrapers discharging into the dry box continued until January 24 when a belt conveyor 36 inches wide and 600 feet long was placed in operation extending northerly from the dry box and on July 31 this belt was fed at its northerly end, by a 36-inch movable radial belt conveyor, 700 feet long, with a 75-horsepower motor. This movable conveyor was built on short sections of trestle mounted on skids and located in a deep cut made in the westerly portion of the borrow pit. This conveyor was moved, with a shutdown of about an hour, by successively pushing the individual sections with a bull-



## MAIN DAM OF QUABBIN RESERVOIR

Length, 2640 feet.

Maximum height above ground, 170 feet.

Maximum height above rock, 295 feet.

Maximum thickness at base about 1000 feet.

Maximum depth of water, 150 feet.

Embankment 4,000,000 cubic yards.



CONTRACT 52—Looking Along Center Line of Main Dam Embankment Under Construction by Hydraulic Sluicing, Central Pool at Elevation 465, One-half the Future 170-foot Height.



CONTRACT 52—East Abutment Showing Belt Conveyor to Hog Box on Hill at Elevation 645, and Sluice Lines to Beaches. Batter Boards Indicate Ultimate Top of Dam at Elevation 550.





dozer. This belt was normally fed by two 2-cu. yd. diesel shovels working along the west face of the pit which was about 40 feet high. These shovels dumped into hoppers which were moved on tracks along the conveyor line, keeping up with shovels moving along the face of the cut. In addition, starting October 4, excavation was also made from the lower borrow pit by 6 tractor-drawn scrapers, from 5 to 10 cubic yards in capacity, which fed a 36-inch belt conveyor 500 feet long with a 100-horsepower motor, and emptying on to the main conveyor system at the central dry box. Material from the high-level borrow pit was excavated by the 2 shovels and trucked to the dry box.

During the first two weeks of October the movable conveyor in the lower pit was shut down and the shovels moved to the higher pit in order to obtain a larger percentage of fines. On November 11 the contractor started to move his conveyor lines into the upper pit in preparation for next season.

To remedy occasional coarse intrusions in the core, jetting was started July 1 and was carried on as required until the end of the year. The jetting rig consisted of a gasoline-driven pump, 500 gallons per minute capacity, mounted on a float. It took water from the surface of the pool and forced it through a 2-inch jet pipe which was suspended from a head frame on the float. This jet pipe was lowered into the core at the desired location and there moved up and down agitating and mixing the core material.

On working days after June 1 there were placed an average of about 14,000 cubic yards per day, the maximum being about 22,700 on August 12, and the hours of plant operation per day averaging 21.

Operations were shut down for the winter on November 11, after 1,964,700 cubic yards of hydraulic fill had been placed, including 67,300 cubic yards of selected coarse material for the upstream face.

Starting September 25, coarse aggregate from the aggregate plant was placed on the upstream face of the dam in a layer 12 inches thick as a foundation for the riprap. At the end of the year 2,600 cubic yards had been placed.

Cobbles and boulders from the borrow which were rejected at the dry box or picked from the belts were stocked and later delivered by trucks and placed as light riprap on the upstream face of the dam. Where possible, the material was dumped from the berm directly into place but the greater part of it was placed by backing the truck down the slope and dumping the riprap above that previously placed, the truck being pulled back by a caterpillar tractor. Approximately 6,500 cubic yards have been placed on the upstream face of the dam. A considerable quantity of such rejected boulders was trucked to the upstream beach and thus incorporated in the pervious embankment of the dam.

Work was in progress on the continuation of the drainage system at the downstream toe of the dam. Work was also in progress on the intake structure extending up through the embankment from the stream control tunnel at the point where this tunnel will later be plugged. From September 4 to October 22 the concrete was carried up to elevation 496.5. The concrete was mixed in a paving mixer on the steep hillside and placed at first by chuting and later by buggies on trestles. From September 29 to November 18 the intermediate intake conduit was constructed, extending horizontally on the hydraulic fill from the intake shaft to the opening on the upstream face from which water may be drawn between elevations 465.0 and 473.0. To place this concrete the mixer was located on the embankment alongside the conduit and concrete was placed by buggies. The intermediate intake was completed except wing walls. In August all but about 40 feet of the 72-inch steel pipe to be laid in the stream control tunnel between the intake and outlet works was delivered and stored.

At the beginning of the year the contractor started excavation of the spillway site in the natural depression east of the dam. Peat was taken out and wasted in an area about 700 feet downstream from the dam on the west side of the old river channel. Suitable material from the spillway excavation was used in the fills for the east access road. About 71,000 cubic yards of earth were removed including cuts required for the access road near the site of the bridge over the spillway channel, and about 5,500 cubic yards of rock were excavated to provide drainage at the north end.



The concrete cut-off wall across the auxiliary spillway channel west of the dam was continued to completion December 12, 1936, except for granite cap stones, and at the same time a reinforced concrete septic tank to be later connected with the future administration buildings was built downstream from the cut-off wall.

A reinforced concrete water tank for the water supply of the future administration buildings was built on the hill at the west end of the dam. This tank is 27 feet inside diameter by 17.5 feet maximum inside height, with a capacity of 50,000 gallons and a maximum flow line about 80 feet above the main floor of the administration buildings.

In order to obtain a water supply for his own use, the contractor sank a drilled well 342 feet deep in the vicinity of his office.

The value of work included in contract estimates during the year was \$853,-652.00, or a total to November 15, the date of the latest estimate, of \$913,-991.00, of which 90 per cent was approved for payment. The contractor's force averaged about 110 men during the first half of the year, and about 310 during the last half of the year, when the hydraulic fill was being placed, the maximum being 399 for the week ending October 23. Camp facilities have not been provided at the work.

The total electric energy used by the contractor during the year was 3,745,800 kilowatt hours, making a total of 3,764,300 kilowatt hours to date.

In addition to the conveyor and sluicing plant for the hydraulic fill already described, the following important items of plant were added during the year:

- 4 Diesel shovels, 2-cu. yd. capacity
- 2 Diesel draglines, 1-cu. yd. capacity
- 1 Diesel crane
- 14 Caterpillar tractors (4 with bulldozer equipment)
- 2 8-cu. yd. bottom-dump trucks
- 8 10-cu. yd. bottom dump wagons
- 5 10-cu. yd. scraper wagons
- 1 5-cu. yd. scraper wagon
- 1 Double-section sheep's-foot roller
- 2 5-cu. yd. trucks (in addition to rented trucks)
- Miscellaneous smaller trucks, concreting equipment, pumps, drills, etc.

The total work done and materials furnished to date under the principal items of Contract 52 are as follows:

Earth excavation . . . . .	101,500 cu. yds.
Rock excavation . . . . .	13,860 " "
Consolidated pervious embankment . . . . .	17,600 " "
Rolled impervious embankment . . . . .	1,900 " "
Embankment by full-hydraulic method . . . . .	1,897,400 " "
Miscellaneous embankment . . . . .	80,000 " "
Selected coarse material . . . . .	67,300 " "
Crushed stone or screened gravel . . . . .	3,100 " "
Light riprap . . . . .	7,200 " "
Heavy riprap . . . . .	540 " "
Furnishing and placing grout . . . . .	925 " "
Portland cement . . . . .	7,000 bbls.
Concrete, Class A . . . . .	3,355 cu. yds.
Concrete, Class B . . . . .	1,080 " "
Reinforcing steel . . . . .	55,000 pounds

*Contract 53.*—Contract 53, with The English Construction Company, for constructing the head house at Shaft 9 of Quabbin Aqueduct, was completed June 9.

The value of work included in contract estimates during the year was \$1,-209.00, or a total to January 15, the date of the latest estimate, of \$9,021.00, of which 90 per cent has been approved for payment. Following completion of the work, a final estimate was prepared, but settlement has not yet been made.

*Contract 54.*—Contract 54, with Carlo Bianchi & Company, for the construction of 1.83 miles of road in the towns of Dana and Petersham, was completed on November 17, 1936.

The value of work included in contract estimates during the year was \$1,-184.28, the final estimate dated December 7, 1936, being for \$63,840.60.

*Contract 55.*—Contract 55, with Arute Bros., Incorporated, for the construction of 4.34 miles of state highway in the Town of Petersham, was completed July 19. Work during the year consisted of completing the cable guard rail, grading and miscellaneous cleaning up.





CONTRACT 51—East Branch Baffle in Greenwich, Looking East.



CONTRACT 53—Easterly Side of Head House, Shaft 9 of Quabbin Aqueduct, Showing Vent From Tunnel 200 feet below.





The value of work included in contract estimates during the year was \$30,-914.06, the final estimate dated August 27, being for \$239,156.65, of which \$110,991.47, covering mainly surfacing items and guard rail, was assumed by the Department of Public Works.

*Contract 56.*—Bids were opened June 10, for constructing the administration buildings near the main dam of Quabbin Reservoir in the Town of Belchertown. Fourteen bids were received, ranging from \$362,445.00 to \$490,000.00. The contract was executed July 28 with Rich Bros. Construction Co., Inc., Boston, Mass., the lowest bidder. The work contracted for consists of constructing a three-story administration building facing the north, overlooking the reservoir, flanked on the east and west by two residences with garages on either side of a rear courtyard. It also includes a boathouse and hangar, located in front of and at a lower level than the main administration building and fronting directly on the margin of the reservoir.

Work started August 2 on the clearing of the site. Excavation for the buildings and pipe trenches was started August 12 and practically completed during the year. The first concrete was poured in the footings and walls of the west garage August 28. Sand and stone for concrete aggregates were trucked to the job. Brick and tile work was started September 20 in the west garage. Waterproofing was started September 24 with the application of mastic waterproofing to the outside of the foundation walls.

Setting of structural steel started September 29 in the west garage. Gypsum roof planking was started November 16. Laying of pipe in the surface drainage and sewage disposal system started October 1, and in the subsurface drainage system for the buildings, October 9. The laying of the water supply lines from the tank on the hill at the west end of the dam, constructed under Contract 52, was started September 3. At the end of the year work on the buildings had progressed as follows: Brick walls and tile backing were completed for the garages and residences, and were carried generally above the second floor level in the main building. Structural steel was practically completed in the garages and residences and for the first floor level of the main building. Gypsum roof planking was completed on the garages and partially complete on the east residence. About 650 feet of 12-inch vitrified tile pipe was completed in the main surface drainage. The 8-inch cast-iron sewer pipe leading to the septic tank, downstream from the emergency spillway wall built under Contract 52, was completed except for branch connections. The subsurface drainage system for the buildings was practically completed. The water supply pipe from the well sunk under Contract 59 to the concrete tank built under Contract 52 and connections were completed. Progress was made on the installation of a 5000-gallon fuel tank and two boilers in the basement of the main building.

The value of work included in contract estimates to November 10, the date of the latest estimate, was \$93,428.12, of which 90 per cent was approved for payment. The contractor's force averaged 56 men for a period of 17 weeks, the maximum being 90 for the week ending November 20.

*Contract 57.*—Contract 57, with John Iafolla Construction Co., for the construction of 3.65 miles of state highway in the Town of New Salem, was continued and practically completed. The work of grading and drainage was continued to completion early in the year. Nine borrow pits were used along the line of the work. This highway, which is a continuation in Franklin County of the highway in Worcester County completed under Contract 55, is 30 feet wide and consists of a penolithic surface course 24 feet wide and 2 inches thick on a broken stone course 4 inches thick placed on a sub-base of gravel 12 inches thick. The penolithic wearing surface was penetrated with a light oil and then with asphalt cement heated to about 350° F. and applied at a pressure between 20 and 75 pounds per square inch and a rate of about 1.2 gallons per square yard of surface. The surface was then rolled, and intermediate aggregate that had previously been treated with oil was applied and the surface re-rolled. A seal coat of asphalt cement was applied at the rate of 0.4 gallons per square yard, treated with oiled fine aggregate and then rolled. Shoulders 5 feet wide were constructed in fills where guard rail was required. Berm ditches were constructed beyond the tops of cut slopes to divert surface water from



these slopes and the slopes of all cuts and of some fills were loamed. The construction work was completed on September 29.

The value of the work of this contract as shown by the final estimate dated November 24, is \$168,822.96. There has been paid the contractor \$142,640.38, of which the Department of Public Works, for surfacing and guard rail, paid \$60,231.34. Of the remainder to be paid, the Department of Public Works will pay \$12,819.72. The contractor's force averaged 32 men for a period of 31 weeks, the maximum being 70 for the week ending June 26.

The only important items of plant added during the year were two stone spreaders.

The total work done and materials furnished under the principal items of Contract 57 are as follows:

Roadway earth excavation . . . . .	68,405 cu. yds.
Ledge excavation . . . . .	3,060 " "
Ordinary borrow . . . . .	72,790 " "
Plain cement concrete masonry (1-2½-5) . . . . .	160 " "
Reinforced cement concrete masonry (1-2-4) . . . . .	105 " "
Broken stone for base course . . . . .	11,465 ton
Side drains with 6-inch pipe . . . . .	1,525 lin. ft.
Gravel borrow . . . . .	25,240 cu. yds.
Highway guard rail . . . . .	13,580 lin. ft.
Trench excavation . . . . .	3,175 cu. yds.
Clearing and grubbing . . . . .	35 acres
Loam borrow . . . . .	10,765 cu. yds.
Loam berms . . . . .	1,775 lin. ft.
Peat excavation . . . . .	14,705 cu. yds.
Bituminous material . . . . .	87,470 gals.
Oiled broken stone . . . . .	7,565 tons

*Contract 59.*—Bids were opened March 18, for drilling a well for the water supply of the administration buildings in the Town of Belchertown. Three bids were received, ranging from \$857.50 to \$1,517.50. The contract was executed March 30 with the Wachusett Artesian Well Company, West Boylston, Mass., the lowest bidder. The work was completed on April 21. Twenty-two feet of 8-inch casing was sunk and sealed 1.5 feet into the ledge. Inside the 8-inch casing, 32 feet of 6-inch casing was sunk 10 feet further into the rock and the space between the two filled with grout. The well was sunk with a 6-inch bit to elevation 394.1, 150 feet below the ground surface. Upon completion, the well yielded 30 gallons per minute for 24 hours.

The amount of the final estimate dated April 22, was \$691.28, all of which has been paid. The only labor employed was one drill runner and one helper.

#### LIST OF DRAWINGS AND TABLES APPENDED HERETO

Location of Real Estate Acquired for Quabbin Reservoir.

Takings of Real Estate and Water Rights.

Status of Contracts Completed between November 30, 1936 and November 30, 1937; and in Force on November 30, 1937.

Monthly Rainfall at Stations on Ware and Swift watersheds, 1937.

For data on contracts completed prior to November 30, 1936, see sixth to eleventh annual reports, inclusive. A General Plan and Profile of the Present and Proposed Metropolitan Water Supply was included in the geological report appended to the 1935 annual report.

For summaries of rainfall for years previous to 1937, see 1935 and 1936 annual reports.

Respectfully submitted,

FRANK E. WINSOR, *Chief Engineer.*

20 SOMERSET STREET, BOSTON, MASS.

January 3, 1938.





QUABBIN PARK CEMETERY—Looking northerly Along Laurel Road



CONTRACT 57—Looking Westerly along Petersham-New Salem Highway.





# FINANCIAL STATEMENT OF THE METROPOLITAN DISTRICT WATER SUPPLY COMMISSION

\*EXPENDITURES AND DISBURSEMENTS FOR THE FISCAL YEAR AND FROM JULY 28,  
1926, THE DATE OF THE APPOINTMENT OF THE COMMISSION

New accounts have been opened during the year necessitating transfers from  
old accounts.

## GENERAL OVERHEAD

	Year ending Nov. 30, 1937	Total to Nov. 30, 1937
<i>ADMINISTRATION, Commissioners' Office:</i>		
Salaries, Commissioners . . . . .	\$10,500.00	\$117,415.56
Salaries, Clerical . . . . .	15,198.78	127,548.67
General Legal Expense . . . . .	00.00	2,169.16
Furniture and Fixtures . . . . .	172.16	4,569.20
Engineering Instruments . . . . .	00.00	98.00
Rent and Upkeep . . . . .	2,417.81	25,300.64
Automobile Purchase . . . . .	453.03	2,917.93
Automobile Maintenance . . . . .	263.77	3,284.43
Miscellaneous Expense (undistributed) . . . . .	2,156.35	17,202.30
Advertising . . . . .	1,419.07	11,011.57
Printing and Blueprinting . . . . .	955.31	10,697.50
Stationery and Office Supplies . . . . .	461.12	3,063.24
Postage . . . . .	161.00	1,627.05
Total Administration, Commissioners' Office	\$34,158.40	\$326,905.25
<i>ENGINEERING, Headquarters' Office:</i>		
Salaries, Engineering . . . . .	\$79,268.51	\$865,665.37
Salaries, Clerical . . . . .	12,533.64	106,799.13
General Consultant Expense . . . . .	00.00	116,515.25
General Legal Expense . . . . .	00.00	53,160.29
Furniture and Fixtures . . . . .	56.50	15,119.44
Laboratory Equipment . . . . .	00.00	1,961.00
Laboratory Supplies . . . . .	00.00	2,071.94
Rental of Equipment . . . . .	00.00	3,370.02
Engineering Instruments . . . . .	73.50	1,258.04
Rent and Upkeep of Boston Office . . . . .	11,127.44	116,053.26
Rent and Upkeep of Springfield Laboratory . . . . .	00.00	3,950.54
Automobile Purchase . . . . .	453.02	3,604.62
Automobile Maintenance . . . . .	263.75	4,169.16
Special Experiments . . . . .	00.00	2,304.63
Miscellaneous Expense (undistributed) . . . . .	897.28	22,814.83
Printing and Blueprinting . . . . .	1,303.09	16,155.39
Stationery and Office Supplies . . . . .	541.83	6,363.71
Postage . . . . .	261.00	2,341.48
Total Engineering, Headquarters' Office	\$106,779.11	\$1,343,678.10
<i>UNASSIGNED:</i>		
Unassigned Supplies and Equipment . . . . .	-\$421.15	\$00.00*
Total General Overhead	\$140,516.36	\$1,670,583.35

\*Account closed upon recommendation of State Auditor's Office



Year ending  
Nov. 30, 1937Total to  
Nov. 30, 1937

## DISTRIBUTION OF GENERAL OVERHEAD

ADMINISTRATION, *Commissioners' Office:*

Wachusett-Coldbrook Tunnel . . . . .	\$1,229.08	\$78,404.30
Coldbrook-Swift Tunnel . . . . .	583.64	29,751.01
Quabbin Reservoir . . . . .	27,395.34	138,493.15
Main Dam . . . . .	2,781.60	39,507.48
Beaver Brook Dike . . . . .	959.64	28,116.49
Southern Sudbury Emergency Supply . . . . .	00.00	8,690.28
Metropolitan System—General (Expenditures under Chapter No. 48) . . . . .	1,209.10	2,433.76
Cochituate Supply (Expenditures under Chapter No. 18) . . . . .	00.00	1,508.78
Total Administration Commissioners' Office	\$34,158.40	\$326,905.25

ENGINEERING, *Headquarters' Office:*

Wachusett-Coldbrook Tunnel . . . . .	\$3,470.13	\$313,252.74
Coldbrook-Swift Tunnel . . . . .	1,782.76	113,760.60
Quabbin Reservoir . . . . .	74,782.94	619,741.92
Main Dam . . . . .	11,470.69	140,531.55
Beaver Brook Dike . . . . .	4,626.67	105,045.70
Southern Sudbury Emergency Supply . . . . .	00.00	33,407.97
Metropolitan System-General (Expenditures under Chapter No. 48) . . . . .	10,645.92	13,879.37
Cochituate Supply (Expenditures under Chapter No. 18) . . . . .	00.00	4,058.25
Total Engineering, Headquarter's Office	\$106,779.11	\$1,343,678.10

WACHUSETT-COLDBROOK TUNNEL SECTION OF QUABBIN AQUEDUCT  
WARE SUPPLY

## GENERAL OVERHEAD:

Administration, Commissioners' Office . . . . .	\$1,229.08	\$78,404.30
Engineering, Headquarters' Office . . . . .	3,470.13	313,252.74
Total General Overhead . . . . .	\$4,699.21	\$391,657.04

## ENGINEERING:

Salaries, Engineering and Clerical . . . . .	\$1,750.74	\$398,503.59
Consultant Expense . . . . .	325.01	7,974.87
Labor . . . . .	162.50	4,037.33
Furniture and Fixtures . . . . .	3.14	2,306.95
Engineering Instruments . . . . .	118.02	7,697.24
Rent and Upkeep . . . . .	969.27	18,721.32
Automobile Purchase . . . . .	156.07	11,578.89
Automobile Maintenance . . . . .	215.83	15,646.44
Contracts for Investigations and Surveys . . . . .	00.00	18,640.69
Miscellaneous Expense (undistributed) . . . . .	415.53	9,986.10
Advertising . . . . .	00.00	6.05
Printing and Blueprinting . . . . .	33.40	1,133.70
Stationery and Office Supplies . . . . .	45.88	3,073.29
Postage . . . . .	9.25	453.32
Total Engineering . . . . .	\$4,204.64	\$499,759.78

	Year ending Nov. 30, 1937	Total to Nov. 30, 1937
<b>REAL ESTATE—General Construction:</b>		
Legal and Expert Expense . . . . .	\$18.43	\$6,205.35
Consultant Expense . . . . .	00.00	455.66
Labor . . . . .	00.00	1,711.20
Miscellaneous Expense (undistributed) . . . . .	00.00	1,003.60
Printing and Blueprinting . . . . .	00.00	62.36
Purchases and Settlements . . . . .	200.00	123,347.50
Taxes . . . . .	00.00	3,682.24
Maintenance of Real Estate . . . . .	00.00	1,298.18
Police Protection		
Labor . . . . .	00.00	41.00
Fire Protection		
Equipment . . . . .	00.00	1,254.66
Miscellaneous Expense . . . . .	00.00	00.54
Special Agents		
Salaries . . . . .	00.00	12,949.00
Furniture and Fixtures . . . . .	00.00	117.67
Automobile Purchase . . . . .	00.00	1,222.50
Automobile Maintenance . . . . .	00.00	2,124.30
Miscellaneous Expense (undistributed) . . . . .	00.00	1,201.73
Printing and Blueprinting . . . . .	00.00	26.51
Stationery and Office Supplies . . . . .	00.00	5.48
Postage . . . . .	00.00	21.36
Total Real Estate . . . . .	\$218.43	\$156,730.84
<b>WARE WATERSHED PROTECTION:</b>		
Salaries, Engineering and Clerical . . . . .	\$11,308.16	\$136,144.88
Legal and Expert Expense . . . . .	5,590.47	27,038.94
Consultant Expense . . . . .	00.00	763.70
Labor . . . . .	2,774.36	14,902.54
Engineering Instruments . . . . .	28.99	407.10
Rent and Upkeep . . . . .	200.42	414.61
Furniture and Fixtures . . . . .	00.00	62.92
Completed Contracts Nos. 27 and 39 . . . . .	00.00	243,104.18
Automobile Purchase . . . . .	96.08	1,242.53
Automobile Maintenance . . . . .	841.64	5,472.80
Special Experiments . . . . .	00.00	700.00
Compensation to Labor for Injuries . . . . .	774.85	774.85
Medical and Surgical Supplies . . . . .	200.00	200.00
Miscellaneous Expense (undistributed) . . . . .	302.75	5,752.00
Printing and Blueprinting . . . . .	102.28	726.84
Stationery and Office Supplies . . . . .	92.09	374.85
Advertising . . . . .	00.00	2.00
Postage . . . . .	18.70	50.55
Installed Equipment . . . . .	00.00	5,610.75
Rental of Equipment . . . . .	2.50	2.50
Purchases and Settlements . . . . .	136,166.99	1,340,983.81
Taxes . . . . .	12,819.03	48,044.88
Maintenance of Real Estate . . . . .	4,577.08	9,313.28
Purchase and Planting of Trees and Shrubbery . . . . .	-720.00	00.00
Special Agents		
Salaries . . . . .	2,460.00	9,648.67
Automobile Purchase . . . . .	318.65	622.00
Automobile Maintenance . . . . .	461.24	1,917.08
Miscellaneous Expense (undistributed) . . . . .	371.56	1,210.26
Printing and Blueprinting . . . . .	110.58	167.40
Stationery and Office Supplies . . . . .	00.00	3.91
Postage . . . . .	3.00	23.55



	Year ending Nov. 30, 1937	Total to Nov. 30, 1937
Labor . . . . .	15.00	15.00
Police Protection		
Labor . . . . .	54.00	64.06
Fire Protection		
Equipment . . . . .	00.00	39.09
Rutland-Holden Sewer, Maintaining, Cleaning and Repairing		
State Sanatorium Branch . . . . .	55.92	478.07
U. S. Vet. Hospital Branch . . . . .	65.76	516.70
Trunk Sewer, except Branches . . . . .	213.24	1,291.16
Use of City of Worcester's Sewerage System for disposal of Sewage from Rutland- Holden Sewer . . . . .	759.32	775.10
Reforestation, Watershed Planting		
Trees for Watershed Planting . . . . .	1,521.89	1,521.89
Total Ware Watershed Protection. . . . .	\$181,586.55	\$1,860,384.39

## WARE DIVERSION DAMAGES—EXCEPT AWARDS BY COURT DECREE:

Salaries, Engineering and Clerical . . . . .	-\$2,109.74	\$84,674.25
Legal and Expert Expense . . . . .	5.32	3,177.15
Consultant Expense . . . . .	-1,921.37	33,537.61
Labor . . . . .	63.50	2,434.48
Furniture and Fixtures . . . . .	00.97	30.73
Laboratory Equipment . . . . .	6.90	280.11
Laboratory Supplies . . . . .	56.73	433.44
Engineering Instruments . . . . .	00.00	560.34
Rental of Equipment . . . . .	00.00	203.75
Rent and Upkeep . . . . .	39.44	44.19
Automobile Purchase . . . . .	00.00	170.42
Automobile Maintenance . . . . .	30.52	4,000.65
Contracts for Investigation and Surveys . . . . .	00.00	63.27
Materials of Construction . . . . .	00.00	136.51
Miscellaneous Expense (undistributed) . . . . .	3.07	7,339.46
Printing and Blueprinting . . . . .	3.91	1,261.10
Stationery and Office Supplies . . . . .	00.05	64.10
Postage . . . . .	00.00	6.62
Purchases and Settlements . . . . .	30,108.33	196,633.33
Sub total Ware Diversion Damages— Except Awards by Court Decree . . . . .	\$26,287.63	\$324,051.51

## WARE DIVERSION DAMAGES—AWARDS BY COURT DECREE:

## JURY VERDICTS:

Salaries, Engineering and Clerical . . . . .	\$5,183.45	\$61,087.46
Legal Expense . . . . .	-19,751.71	37,806.71
Consultant and Engineering Expert Expense . . . . .	16,117.40	92,969.39
Expert and other Witness Expense . . . . .	49,607.79	63,740.91
Automobile Maintenance . . . . .	00.00	440.58
Miscellaneous Expense (undistributed) . . . . .	948.96	7,526.44
Printing and Blueprinting . . . . .	78.91	682.98
Stationery and Office Supplies . . . . .	21.83	146.83
Postage . . . . .	4.10	19.63
Settlements . . . . .	00.00	260,000.00
Payments under Certificates of Judgment . . . . .	53,018.50	560,458.62
Sub Total Ware Diversion Damages— Awards by Court Decree:—Jury Verdicts	\$105,229.23	\$1,084,879.55

	Year ending Nov. 30, 1937	Total to Nov. 30, 1937
WARE DIVERSION DAMAGES—PAYMENTS TO COUNTIES FOR RE- IMBURSEMENT FOR EXPENSES OF LITIGATION IN COUNTY COURTS:		
County of Hampshire . . . . .	\$15,000.00	\$15,000.00
Total Ware Diversion Damages . . . . .	\$146,516.86	\$1,423,931.06
PERMANENT CONSTRUCTION—CONSTRUCTION CONTRACTS:		
Completed Contracts . . . . .	\$00.00	\$9,629,739.99
PERMANENT CONSTRUCTION—EXCEPT CONSTRUCTION CONTRACTS:		
Installed Equipment . . . . .	\$4,067.60	\$63,066.43
Temporary Equipment . . . . .	00.00	6,423.60
Labor . . . . .	189.25	4,415.69
Compensation to Labor for Injuries . . . . .	18.29	18.29
Contracts for Equipment for Surveys . . . . .	00.00	898.34
Maintenance of Partially Completed Structures . . . . .	1,719.79	11,574.60
Maintenance of Grounds . . . . .	682.50	5,614.69
Purchases of Plants, Trees and Shrubbery . . . . .	00.00	842.58
Rental of Equipment . . . . .	00.00	7.00
Miscellaneous Expense . . . . .	00.00	9,453.84
Materials of Construction . . . . .	00.00	25.87
Total Permanent Construction—Except Construction Contracts . . . . .	\$6,677.43	\$102,340.93
TOTAL WACHUSETT-COLDBROOK TUNNEL, WARE SUPPLY . . . . .	\$343,903.12	\$14,064,544.03

## WACHUSETT WATERSHED PROTECTION

## ENGINEERING:

Salaries, Engineering and Clerical . . . . .	\$1,536.46	\$5,542.53
Legal Expense . . . . .	00.00	3.55
Labor . . . . .	265.24	700.24
Automobile Maintenance . . . . .	54.95	200.18
Miscellaneous Expense (undistributed) . . . . .	6.44	265.93
Printing and Blueprinting . . . . .	00.00	19.91
Postage . . . . .	2.10	5.95
TOTAL WACHUSETT WATERSHED PROTECTION	\$1,865.19	\$6,738.29

## COLDBROOK-SWIFT TUNNEL SECTION OF QUABBIN AQUEDUCT

## GENERAL OVERHEAD:

Administration, Commissioners' Office . . . . .	\$583.64	\$29,751.01
Engineering, Headquarters' Office . . . . .	1,782.76	113,760.60
Total General Overhead . . . . .	\$2,366.40	\$143,511.61

## ENGINEERING:

Salaries, Engineering and Clerical . . . . .	\$7,199.76	\$266,922.24
Consultant Expense . . . . .	33.75	586.73
Labor . . . . .	492.90	2,499.30
Furniture and Fixtures . . . . .	12.50	1,567.40
Engineering Instruments . . . . .	15.72	4,577.18
Rent and Upkeep . . . . .	230.50	10,657.11
Rental of Equipment . . . . .	00.00	3.00
Automobile Purchase . . . . .	00.00	8,010.52
Automobile Maintenance . . . . .	231.95	18,029.31



	Year ending Nov. 30, 1937	Total to Nov. 30, 1937
Contracts for Investigations and Surveys . . . . .	00.00	13,525.66
Materials of Construction . . . . .	00.00	2.25
Miscellaneous Expense (undistributed) . . . . .	114.04	8,069.82
Printing and Blueprinting . . . . .	1.96	955.51
Stationery and Office Supplies . . . . .	38.71	2,190.41
Postage . . . . .	10.37	525.81
Total Engineering . . . . .	\$8,382.16	\$338,122.25
REAL ESTATE:		
Legal and Expert Expense . . . . .	\$00.00	\$3,103.53
Labor . . . . .	00.00	12.20
Miscellaneous Expense (undistributed) . . . . .	00.00	27.16
Printing and Blueprinting . . . . .	00.00	34.87
Postage . . . . .	00.00	5.68
Purchases and Settlements . . . . .	00.00	23,610.00
Taxes . . . . .	00.00	724.77
Maintenance of Real Estate . . . . .	00.00	252.79
Fire Protection Equipment . . . . .	00.00	60.86
Total Real Estate . . . . .	\$00.00	\$27,831.86
PERMANENT CONSTRUCTION—CONSTRUCTION CONTRACTS:		
Completed Contract No. 20 . . . . .	\$00.00	\$4,809,852.83
Contract No. 53, Construction of Head House at Shaft 9 . . . . .	1,088.10	8,118.90
Total Contracts . . . . .	\$1,088.10	\$4,817,971.73
PERMANENT CONSTRUCTION—EXCEPT CONSTRUCTION CONTRACTS:		
Labor . . . . .	\$4.00	\$312.95
Installed Equipment . . . . .	6,749.02	7,238.36
Water Supply System . . . . .	00.00	3,417.56
Miscellaneous Expense . . . . .	21.00	2,547.20
Total Permanent Constr. Except Constr. Contracts . . . . .	\$6,774.02	\$13,516.07
COLDBROOK-SWIFT DAMAGES—EXCEPT AWARDS BY COURT DECREE:		
Purchases and Settlement . . . . .	\$2,800.00	\$2,800.00
COLDBROOK-SWIFT DAMAGES—AWARDS BY COURT DECREE—JURY VERDICTS:		
Legal Expense . . . . .	\$42.00	\$42.00
Total Coldbrook-Swift Damages . . . . .	\$2,842.00	\$2,842.00
TOTAL COLDBROOK-SWIFT TUNNEL . . . . .	\$21,452.68	\$5,343,795.52
QUABBIN RESERVOIR EXCEPT MAIN DAM AND DIKE		
GENERAL OVERHEAD:		
Administration, Commissioners' Office . . . . .	\$27,395.34	\$138,493.15
Engineering, Headquarters' Office . . . . .	74,782.94	619,741.92
Total General Overhead . . . . .	\$102,178.28	\$758,235.07
ENGINEERING:		
Salaries, Engineering and Clerical . . . . .	\$69,249.10	\$489,580.29
Consultant Expense . . . . .	2,543.27	3,361.02
Labor . . . . .	8,989.74	25,859.78

	Year ending Nov. 30, 1937	Total to Nov. 30, 1937
Compensation to Labor for Injuries . . . . .	6.86	6.86
Furniture and Fixtures . . . . .	61.11	3,232.21
Laboratory Equipment . . . . .	69.07	2,314.53
Laboratory Supplies . . . . .	566.18	4,189.99
Rental of Equipment . . . . .	00.00	16.75
Engineering Instruments . . . . .	—217.99	6,311.91
Rent and Upkeep . . . . .	2,883.66	13,460.65
Medical and surgical services . . . . .	5.00	5.00
Automobile Purchase . . . . .	1,305.62	21,982.96
Automobile Maintenance . . . . .	5,309.55	24,167.55
Special Experiments . . . . .	00.00	422.80
Contracts for Investigations and Surveys . . . . .	00.00	14,683.87
Office Buildings . . . . .	00.00	5,059.20
Miscellaneous Expense (undistributed) . . . . .	1,997.93	8,750.88
Printing and Blueprinting . . . . .	435.83	2,968.97
Stationery and Office Supplies . . . . .	817.83	7,326.69
Postage . . . . .	262.69	1,688.92
<b>Total Engineering . . . . .</b>	<b>\$94,285.45</b>	<b>\$635,390.83</b>

## REAL ESTATE—EXCEPT AWARDS BY COURT DECREE:

Legal and Expert Expense . . . . .	\$8,519.71	\$170,450.37
Consultant Expense . . . . .	00.00	146.78
Labor . . . . .	10,097.00	17,439.12
Compensation to Labor for Injuries . . . . .	65.67	65.67
Furniture and Fixtures . . . . .	00.00	46.06
Automobile Maintenance . . . . .	252.64	359.08
Miscellaneous Expense (undistributed) . . . . .	515.50	8,652.35
Advertising . . . . .	00.00	208.66
Printing and Blueprinting . . . . .	81.22	1,431.70
Stationery and Office Supplies . . . . .	-00.45	00.00
Purchases and Settlements . . . . .	102,820.70	6,534,649.88
Purchase price, B. & A. R.R. and N.Y.C. lessee, for part of Athol Branch and gen- eral release of all claims for damages for reservoir construction . . . . .	66,240.88	641,240.88*
Taxes . . . . .	54,444.48	396,360.30
Maintenance of Real Estate . . . . .	1,575.70	9,938.08
Water Supply System . . . . .	8.00	48.60
Fire Protection . . . . .		
Equipmnet . . . . .	782.40	5,622.00
Automobile Purchase . . . . .	00.00	771.69
Automobile Maintenance . . . . .	77.73	371.52
Labor . . . . .	4,108.87	5,144.80
Compensation to Labor for Injuries . . . . .	10.00	10.00
Miscellaneous Expense . . . . .	36.38	257.76
Police Protection . . . . .		
Labor . . . . .	15.00	209.00
Special Agents . . . . .		
Salaries . . . . .	2,460.00	22,946.00
Equipment . . . . .	00.00	118.33
Labor . . . . .	30.00	30.00
Automobile Purchase . . . . .	\$318.65	\$1,858.96
Automobile Maintenance . . . . .	352.23	3,845.23

\*Includes interest on settlement of \$575,000.00 which settlement was approved and scheduled by Commission on March 29, 1935, and shown in 1935 expenditures although payment was disapproved by Governor and Council and warrant returned to Comptroller's bureau. Rescheduled by Commission with interest on March 4, 1937, in accordance with judgment received from Superior Court, February 15, 1937.



	Year ending Nov. 30, 1937	Total to Nov. 30, 1937
Miscellaneous Expense (undistributed)	121.61	1,555.93
Printing and Blueprinting . . . . .	00.00	52.72
Stationery and Office Supplies . . . . .	00.00	13.68
Postage . . . . .	00.00	17.07
Renting Agents		
Salaries . . . . .	2,820.00	26,528.10
Legal Expense . . . . .	46.25	166.25
Furniture and Fixtures . . . . .	00.00	29.29
Automobile Purchase . . . . .	00.00	524.95
Automobile Maintenance . . . . .	195.84	312.64
Labor . . . . .	48.00	69.50
Miscellaneous Expense (undistributed)	44.85	933.86
Printing and Blueprinting . . . . .	00.00	18.62
Stationery and Office Supplies . . . . .	1.12	38.28
Postage . . . . .	32.35	217.14
Payments to Towns . . . . .	3,000.00	20,500.00
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Sub Total Real Estate—Except Awards by Court Decree . . . . .	\$259,122.33	\$7,873,200.85

REAL ESTATE—AWARDS BY COURT DECREE—BOARD OF REFEREES:

Salaries of Referees . . . . .	\$14,200.00	\$21,140.00
Salaries, Engineering and Clerical . . . . .	481.50	1,449.38
Legal Expense . . . . .	6,528.29	11,351.82
Consultant and Engineering Expert Expense	1,923.10	2,545.50
Expert and other Witness Expense . . . . .	3,210.00	7,720.07
Automobile Maintenance . . . . .	6.53	6.53
Expenses of Board of Referees . . . . .	214.00	764.30
Miscellaneous Expense . . . . .	546.13	591.91
Printing and Blueprinting . . . . .	21.99	21.99
Stationery and Office Supplies . . . . .	23.72	23.72
Payments under Certificate of Judgment . . . . .	179,041.67	179,041.67
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Sub Total Real Estate—Board of Referees . . . . .	\$206,196.93	\$224,656.89

REAL ESTATE—AWARDS BY COURT DECREE—JURY VERDICTS:

Salaries, Engineering and Clerical . . . . .	\$00.00	\$27.73
Legal Expenses . . . . .	00.00	557.90
Miscellaneous Expense . . . . .	00.00	2.00
Payments under Certificates of Judgment . . . . .	00.00	7,832.66
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Sub Total Real Estate—Jury Verdicts . . . . .	\$00.00	\$8,420.29
Total Real Estate . . . . .	\$465,319.26	\$8,106,278.03

QUABBIN RESERVOIR DAMAGES:

Salaries, Engineering . . . . .	\$00.00	\$48.68
Legal and Expert Expense . . . . .	00.00	931.00
Consultant Expense . . . . .	00.00	2,158.82
Miscellaneous Expense (undistributed)	00.00	15.19
Printing and Blueprinting . . . . .	00.00	2.96
Purchases and Settlements . . . . .	66.00	48,341.00
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Total Quabbin Reservoir Damages . . . . .	\$66.00	\$51,497.65

SWIFT DIVERSION DAMAGES (INCLUDING BEAVER BROOK)

EXCEPT AWARDS BY COURT DECREE:

Salaries, Engineering and Clerical . . . . .	\$7,889.47	\$86,140.01
Legal and Expert Expense . . . . .	8.28	5,814.80
Consultant Expense . . . . .	647.33	70,884.89

	Year ending Nov. 30, 1937	Total to Nov. 30, 1937
Labor . . . . .	571.25	1,535.10
Furniture and Fixtures . . . . .	8.71	78.18
Laboratory Equipment . . . . .	62.18	2,135.12
Laboratory Supplies . . . . .	509.47	3,662.48
Engineering Instruments . . . . .	00.00	762.98
Rent and Upkeep . . . . .	370.38	413.03
Rental of Equipment . . . . .	00.00	10.50
Automobile Purchase . . . . .	00.00	1,533.72
Automobile Maintenance . . . . .	740.10	4,234.36
Contracts for Investigations and Surveys . . . . .	00.00	569.47
Materials of Construction . . . . .	00.00	18.99
Miscellaneous Expense (undistributed) . . . . .	34.55	6,189.82
Printing and Blueprinting . . . . .	13.38	1,067.45
Stationery and Office Supplies . . . . .	00.42	85.68
Purchases and Settlements . . . . .	282,675.00	1,225,650.00
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Sub Total Swift Diversion Damages—		
Except Jury Trial . . . . .	\$293,530.52	\$1,410,786.58

## BEAVER BROOK DIVERSION DAMAGES—AWARDS BY COURT

## DECREE—JURY VERDICTS:

Salaries, Engineering and Clerical . . . . .	\$81.40	\$488.90
Legal Expense . . . . .	—6,350.00	3,303.27
Consultant and Engineering Expert Expense . . . . .	00.00	2,815.05
Expert and other Witness Expense . . . . .	6,350.00	6,350.00
Automobile Maintenance . . . . .	00.00	104.94
Miscellaneous Expense (undistributed) . . . . .	00.00	328.48
Printing and Blueprinting . . . . .	00.00	22.18
Stationery and Office Supplies . . . . .	00.00	19.55
Postage . . . . .	00.00	1.00
Payments under Certificates of Judgment . . . . .	00.00	9,985.53
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Sub Total Swift Diversion Damages—		
Jury Trial . . . . .	\$81.40	\$23,418.90
Total Swift Diversion Damages (including Beaver Brook) . . . . .	\$293,611.92	\$1,434,205.48

## QUABBIN RESERVOIR—CEMETERIES

## QUABBIN PARK CEMETERY CONSTRUCTION:

Salaries, Engineering and Clerical . . . . .	\$403.75	\$12,352.27
Legal and Expert Expense . . . . .	00.00	65.00
Consultant Expense . . . . .	00.00	125.00
Labor . . . . .	6,707.56	24,476.90
Tools and Equipment . . . . .	104.81	472.27
Automobile Purchase . . . . .	2,077.51	3,692.88
Automobile Maintenance . . . . .	569.26	2,286.43
Rental of Equipment . . . . .	00.00	33.19
Purchases and Settlements . . . . .	00.00	8,850.00
Construction Materials . . . . .	549.57	2,219.77
Purchase and Planting of Trees and Shrubbery . . . . .	00.00	218.93
Receiving Vault . . . . .	00.00	2,768.83
Water Supply System . . . . .	00.00	1,251.97
Maintenance of Grounds . . . . .	2,730.93	9,585.09
Miscellaneous Expense (undistributed) . . . . .	950.65	1,184.08
Printing and Blueprinting . . . . .	24.50	183.70
Stationery and Office Supplies . . . . .	17.15	27.20



	Year ending Nov. 30, 1937	Total to Nov. 30, 1937
Completed Contract No. 34 . . . . .	00.00	7,842.94
Compensation to Labor for Injuries . . . . .	37.43	37.43
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Sub Total Quabbin Park Cemetery Construction . . . . .	\$14,173.12	\$77,673.90

REMOVALS FROM CEMETERIES WITHIN RESERVOIR  
AREA TO QUABBIN PARK CEMETERY:

Salaries, Engineering and Clerical . . . . .	\$2,766.25	\$12,110.59
Tools and Equipment . . . . .	37.49	504.29
Automobile Purchase . . . . .	00.00	2,669.99
Automobile Maintenance . . . . .	408.27	1,870.70
Removal and Reinterment of Bodies . . . . .	6,663.94	20,221.06
Removal and Resetting of Monuments . . . . .	3,940.89	12,608.27
Miscellaneous Expense . . . . .	00.00	6.75
Rental of Equipment . . . . .	00.00	10.50
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Sub Total Removals to Quabbin Park Cemetery . . . . .	\$13,816.84	\$50,002.15

REMOVALS FROM CEMETERIES WITHIN RESERVOIR AREA  
TO CEMETERIES OTHER THAN QUABBIN PARK:

Salaries, Engineering and Clerical . . . . .	\$287.50	\$6,350.49
Tools and Equipment . . . . .	15.43	15.43
Automobile Purchase . . . . .	00.00	380.00
Automobile Maintenance . . . . .	48.19	155.73
Purchases and Settlements . . . . .	497.50	7,701.60
Perpetual Care Fund Contributions . . . . .	00.00	175.00
Removal and Reinterment of Bodies . . . . .	747.93	7,373.29
Removal and Resetting of Monuments . . . . .	450.19	6,319.88
Miscellaneous Expense . . . . .	00.00	123.51
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Sub Total Removals to Other Cemeteries . . . . .	\$2,046.74	\$28,594.93
Total Quabbin Reservoir Cemeteries . . . . .	\$30,036.70	\$156,270.98

PERMANENT CONSTRUCTION—CONSTRUCTION CONTRACTS:

Contract No. 47, Construction of Service Building and Head House at Shaft 12 . . . . .	\$6,770.57	\$31,176.09
Contract No. 49, Excavation of Diversion Channels . . . . .	8,500.00	84,789.69
Contract No. 51, Construction of East Branch Baffle . . . . .	41,575.63	189,545.99
Contract No. 56, Construction of Adminis- tration Buildings at Main Dam . . . . .	84,085.31	84,085.31
Completed Contract No. 59, Drilling a Well for Water Supply at Administration Buildings . . . . .	691.28	691.28
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Total Construction Contracts . . . . .	\$141,622.79	\$390,288.36

PERMANENT CONSTRUCTION—AWARDS BY COURT  
DECREE—ACTIONS FOR BREACH OF CONTRACT:

Salaries, Engineering . . . . .	\$3,206.50	\$3,206.50
Legal Expense . . . . .	2,145.45	2,145.45
Miscellaneous Expense . . . . .	314.98	314.98
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Total Awards by Court Decree—Action for Breach of Contracts . . . . .	\$5,666.93	\$5,666.93

	Year ending Nov. 30, 1937	Total to Nov. 30, 1937
OTHER PERMANENT CONSTRUCTION—CONSTRUCTION EXCEPT CLEARING:		
Installed Equipment . . . . .	\$1,287.93	\$1,502.71
Labor . . . . .	1,321.50	1,682.50
Compensation to Labor for Injuries . . . . .	208.10	208.10
Automobile Maintenance . . . . .	-1.20	00.00
Miscellaneous Expense (undistributed) . . . . .	615.62	677.38
Printing and Blueprinting . . . . .	00.00	24.88
Sub Total other Construction Except Clearing . . . . .	\$3,431.96	\$4,094.97

## OTHER PERMANENT CONSTRUCTION—1936 CLEARING PROJECT:

Tools and Equipment . . . . .	\$296.58	\$22,764.76
Labor . . . . .	125,827.42	1,721,299.70
Compensation to Labor for Injuries . . . . .	22,653.23	29,786.93
Miscellaneous Expense (undistributed) . . . . .	328.71	2,743.64
Printing and Blueprinting . . . . .	00.00	69.76
Stationery and Office Supplies . . . . .	35.21	1,029.84
Postage . . . . .	11.00	186.71
Automobile Purchase . . . . .	-10.44	12,031.53
Automobile Maintenance . . . . .	1,499.94	5,404.67
Furniture and Fixtures . . . . .	00.00	877.65
Rent and Upkeep . . . . .	141.65	826.98
Medical and Surgical Equipment . . . . .	48.00	72.82
Medical and Surgical Supplies . . . . .	213.95	2,023.67
Medical and Surgical Services . . . . .	10,612.72	13,558.13
Fire Protection		
Equipment . . . . .	00.00	425.87
Miscellaneous Expense . . . . .	4.12	132.72
Labor . . . . .	1,933.50	4,175.00
Legal Expense . . . . .	3,870.43	4,285.43
Sub Total Other Permanent Construction— 1936 Clearing Project . . . . .	\$167,466.02	\$1,821,795.81

OTHER PERMANENT CONSTRUCTION—QUABBIN RESERVOIR  
CLEARING EXCEPT 1936 CLEARING PROJECT:

Labor . . . . .	\$23,848.80	\$23,848.80
Sub Total Other Permanent Construction- Quabbin Reservoir Clearing Except 1936 Clearing Project . . . . .	\$23,848.80	\$23,484.80
Total Quabbin Reservoir Other Permanent Construction . . . . .	\$194,746.78	\$1,849,739.58

## HIGHWAY AND PUBLIC UTILITY RELOCATION:

Salaries, Engineering and Clerical . . . . .	\$16,082.85	\$211,754.29
Legal and Expert Expense . . . . .	00.00	49.10
Consultant Expense . . . . .	662.81	9,117.56
Labor . . . . .	3,468.65	11,462.16
Furniture and Fixtures . . . . .	00.00	61.74
Completed Contracts Nos. 21, 40, 41, 43 and 44 . . . . .	00.00	818,616.49
Completed Contract No. 54, Construction of a Highway in the Towns of Dana and Petersham . . . . .	10,582.73	63,840.60
Completed Contract No 55, Construction of a Portion of the Petersham-New Salem Highway in the County of Worcester . . . . .	35,455.61	128,165.18



	Year ending Nov. 30, 1937	Total to Nov. 30, 1937
Contract No. 57, Construction of a Portion of the Petersham-New Salem Highway in the County of Franklin . . . . .	55,098.37	82,409.04
Installed Equipment . . . . .	00.00	811.57
Temporary Equipment . . . . .	00.00	149.50
Engineering Instruments . . . . .	00.00	948.75
Automobile Purchase . . . . .	00.00	535.00
Automobile Maintenance . . . . .	625.48	6,009.79
Miscellaneous Expense (undistributed) . . . . .	2,823.73	8,651.30
Printing and Blueprinting . . . . .	11.70	686.88
Stationery and Office Supplies . . . . .	00.00	159.13
Maintenance of Real Estate . . . . .	00.00	551.60
<b>Total Highway and Public Utility Relocation</b>	<b>\$124,811.93</b>	<b>\$1,343,979.68</b>
<b>QUABBIN RESERVOIR WATERSHED PROTECTION—REFORESTATION, NURSERIES:</b>		
Nurseries:		
Salaries, Engineering . . . . .	\$621.00	\$1,798.15
Labor . . . . .	7,343.29	19,213.62
Tools and Equipment . . . . .	1,045.47	3,615.21
Automobile Purchase . . . . .	00.00	398.50
Automobile Maintenance . . . . .	324.31	578.36
Nursery Stock . . . . .	2,622.85	2,622.85
Nursery Supplies . . . . .	-3,119.29	1,850.12
Miscellaneous Expense . . . . .	26.65	193.78
<b>Sub Total Reforestation, Nurseries</b>	<b>\$8,864.28</b>	<b>\$30,216.59</b>
<b>QUABBIN RESERVOIR WATERSHED PROTECTION—REFORESTATION, WATERSHED PLANTING:</b>		
Watershed planting:		
Salaries, Engineering . . . . .	\$465.50	\$903.26
Labor . . . . .	4,716.00	12,516.10
Tools and Equipment . . . . .	00.00	184.81
Automobile Maintenance . . . . .	94.66	166.17
Trees for Watershed Planting . . . . .	1,713.00	1,713.00
Nursery Supplies . . . . .	55.86	1,402.86
Miscellaneous Expense . . . . .	00.00	63.85
<b>Sub Total Reforestation; Watershed Planting</b>	<b>\$7,045.02</b>	<b>\$16,950.05</b>
<b>Total Quabbin Reservoir Watershed Protection</b>	<b>\$15,909.30</b>	<b>\$47,166.64</b>
<b>TOTAL QUABBIN RESERVOIR, EXCEPT MAIN DAM AND DIKE</b>	<b>\$1,468,255.34</b>	<b>\$14,778,719.23</b>

### QUABBIN RESERVOIR MAIN DAM

#### GENERAL OVERHEAD

Administration, Commissioners' Office . . . . .	\$2,781.60	\$39,507.48
Engineering, Headquarters' Office . . . . .	11,470.69	140,531.55
<b>Total General Overhead</b>	<b>\$14,252.29</b>	<b>\$180,039.03</b>

#### ENGINEERING:

Salaries, Engineering and Clerical . . . . .	\$49,537.31	\$221,868.94
Legal and Expert Expense . . . . .	4.06	4.06

	Year ending Nov. 30, 1937	Total to Nov. 30, 1937
Consultant Expense . . . . .	00.00	5,718.54
Labor . . . . .	11,112.56	26,229.49
Furniture and Fixtures . . . . .	8.58	219.09
Laboratory Equipment . . . . .	210.74	664.51
Rental of Equipment . . . . .	00.00	1,202.25
Engineering Instruments . . . . .	105.84	736.38
Rent and Upkeep . . . . .	261.19	1,315.44
Automobile Purchase . . . . .	938.00	2,433.00
Automobile Maintenance . . . . .	1,551.04	5,657.31
Contracts for Investigations and Surveys . . . . .	00.00	61,895.52
Office Buildings . . . . .	00.00	578.39
Special Experiments . . . . .	62.50	1,853.29
Water Supply System . . . . .	00.00	20.00
Medical and Surgical Services . . . . .	4.00	4.00
Miscellaneous Expense (undistributed) . . . . .	463.09	12,533.24
Printing and Blueprinting . . . . .	67.27	1,794.30
Stationery and Office Supplies . . . . .	316.60	1,276.86
Postage . . . . .	37.01	133.58
Laboratory Supplies . . . . .	195.64	195.64
<b>Total Engineering . . . . .</b>	<b>\$64,875.43</b>	<b>\$346,333.83</b>

## PERMANENT CONSTRUCTION—CONSTRUCTION CONTRACTS:

Completed Contracts Nos. 30, 32 and 36 . . . . .	\$00.00	\$804,913.52
Completed Contract No. 38, Constructing a Core Wall to Sound Rock at Main Dam . . . . .	120,632.17	1,606,629.88
Contract No. 52, Constructing Embankment at Main Dam . . . . .	768,286.80	822,591.90
<b>Total Contracts . . . . .</b>	<b>\$888,918.97</b>	<b>\$3,234,135.30</b>

## PERMANENT CONSTRUCTION—EXCEPT CONSTRUCTION CONTRACTS:

Labor . . . . .	\$1,010.55	\$4,584.25
Installed Equipment . . . . .	339.05	3,592.05
Temporary Equipment . . . . .	00.00	4,213.39
Miscellaneous Expense . . . . .	129.86	12,619.55
<b>Total . . . . .</b>	<b>\$1,479.46</b>	<b>\$25,009.24</b>
<b>TOTAL QUABBIN RESERVOIR MAIN DAM . . . . .</b>	<b>\$969,526.15</b>	<b>\$3,785,517.40</b>

## QUABBIN RESERVOIR BEAVER BROOK DIKE

## GENERAL OVERHEAD:

Administration, Commissioners' Office . . . . .	\$959.64	\$28,116.49
Engineering, Headquarters' Office . . . . .	4,626.67	105,045.70
<b>Total General Overhead . . . . .</b>	<b>\$5,586.31</b>	<b>\$133,162.19</b>

## ENGINEERING:

Salaries, Engineering and Clerical . . . . .	\$29,911.60	\$163,582.19
Consultant Expense . . . . .	00.00	5,505.11
Labor . . . . .	6,554.00	29,818.64
Furniture and Fixtures . . . . .	1.23	146.95
Laboratory Equipment . . . . .	210.71	526.44
Rental of Equipment . . . . .	00.00	921.50
Engineering Instruments . . . . .	00.00	155.65
Rent and Upkeep . . . . .	12.03	28.03
Automobile Purchase . . . . .	00.00	600.00



	Year ending Nov. 30, 1937	Total to Nov. 30, 1937
Automobile Maintenance . . . . .	589.17	2,956.11
Contracts for Investigations and Surveys . . . . .	00.00	24,773.32
Special Experiments . . . . .	62.50	305.20
Miscellaneous Expense (undistributed) . . . . .	26.52	4,899.00
Printing and Blueprinting . . . . .	17.83	1,335.46
Stationery and Office Supplies . . . . .	25.05	186.00
Advertising . . . . .	00.00	79.34
Postage . . . . .	00.00	00.30
Laboratory Supplies . . . . .	213.29	213.29
Total Engineering . . . . .	\$37,623.93	\$236,032.53
PERMANENT CONSTRUCTION—CONSTRUCTION CONTRACTS:		
Completed Contracts Nos. 32 and 36 . . . . .	\$00.00	\$1,054,137.90
Contract No. 50, Constructing the Embankment of the Dike . . . . .	262,518.34	1,360,702.17
Total Contracts . . . . .	\$262,518.34	\$2,414,840.07
PERMANENT CONSTRUCTION—EXCEPT CONSTRUCTION CONTRACTS:		
Labor . . . . .	\$1,251.80	\$11,009.05
Temporary Equipment . . . . .	00.00	1,993.18
Tools and Equipment . . . . .	00.00	14.70
Miscellaneous Expense . . . . .	8.44	1,685.76
Installed Equipment . . . . .	00.00	235.00
Total . . . . .	\$1,260.24	\$14,937.69
TOTAL QUABBIN RESERVOIR BEAVER BROOK DIKE . . . . .	\$306,988.82	\$2,798,972.48
SPECIAL INVESTIGATIONS		
RELATIVE TO POLLUTION OF WARE AND QUINAPOXET WATERSHEDS:		
(Expenditures under Chapter 66, Resolves of 1931) . . . . .	\$00.00	\$1,995.99
RELATIVE TO SETTING OFF A PORTION OF LAKE COCHITUATE FOR BOATING AND FISHING:		
(Expenditures under Chapter 18, Resolves of 1936)		
GENERAL OVERHEAD:		
Administration, Commissioners' Office . . . . .	\$00.00	\$1,508.78
Engineering, Headquarters' Office . . . . .	00.00	4,058.25
Total General Overhead . . . . .	\$00.00	\$5,567.03
ENGINEERING:		
Salaries, Engineering and Clerical . . . . .	\$58.65	\$5,904.02
Labor . . . . .	4.50	205.00
Automobile Maintenance . . . . .	37.50	85.35
Miscellaneous Expense (undistributed) . . . . .	71.23	477.27
Printing and Blueprinting . . . . .	23.67	76.61
Stationery and Office Supplies . . . . .	2.82	17.90
Laboratory Supplies . . . . .	00.00	65.00
Contracts for Investigations and Surveys . . . . .	114.40	114.40
Total Engineering . . . . .	\$312.77	\$6,945.55
Total Chapter 18 Investigation . . . . .	\$312.77	\$12,512.58

Year ending  
Nov. 30, 1937Total to  
Nov. 30, 1937RELATIVE TO IMPROVING DISTRIBUTION SYSTEM AND PREVENTING POLLUTION OF  
SOURCE OF SUPPLY OF METROPOLITAN WATER DISTRICT

(Expenditures under Chapter 48, Resolves of 1936)

## GENERAL OVERHEAD:

Administration, Commissioners' Office . .	\$1,209.10	\$2,433.76
Engineering, Headquarters' Office . .	10,645.92	13,879.37
Total General Overhead . . . .	<u>\$11,855.02</u>	<u>\$16,313.13</u>

## ENGINEERING:

Salaries, Engineering and Clerical . . . .	\$40,748.65	\$41,635.45
Furniture and Fixtures . . . . .	221.98	221.98
Engineering Instruments . . . . .	1,120.12	1,120.12
Atlases . . . . .	2,097.00	2,097.00
Automobile Purchase . . . . .	1,492.50	1,492.50
Automobile Maintenance . . . . .	1,754.46	1,754.46
Contracts for Investigations and Surveys .	47,973.30	47,973.30
Miscellaneous Expense (undistributed) .	2,158.42	2,162.12
Printing and Blueprinting . . . . .	231.14	231.14
Stationery and Office Supplies . . . . .	201.14	201.14
Laboratory Supplies . . . . .	23.46	23.46
Total Engineering . . . . .	<u>\$98,022.17</u>	<u>\$98,912.67</u>
Total-Chapter 48 Investigation . . . .	\$109,877.19	\$115,225.80
TOTAL SPECIAL INVESTIGATIONS . . . .	\$110,189.96	\$129,734.37

## SOUTHERN SUDBURY EMERGENCY SUPPLY

GENERAL OVERHEAD: . . . . .	\$00.00	\$42,098.25
ENGINEERING: . . . . .	00.00	44,235.07
REAL ESTATE: . . . . .	00.00	30,553.18
SOUTHERN SUDBURY DIVERSION DAMAGES: . .	00.00	50,752.66
PERMANENT CONSTRUCTION — CONSTRUCTION CONTRACTS: . . . . .	00.00	458,957.30
PERMANENT CONSTRUCTION—EXCEPT CONSTRUCTION CONTRACTS: . . . . .	<u>00.00</u>	<u>11,937.37</u>
TOTAL SOUTHERN SUDBURY EMERGENCY SUPPLY . . . . .	\$00.00	\$638,533.83



Year ending  
Nov. 30, 1937

Total to  
Nov. 30, 1937

## SUMMARY

## CONSTRUCTION FUND

Total authorized under Chapters 111 and 375, Acts of 1926, and Chapter 321, Acts of 1927 . . .	\$65,900,000.00	
Amount reverted from authorization under said Chapter 111 . . .	261,466.17	\$65,638,533.83
<hr/>		
Rec'd from City of Worcester under said Chapter 321 . . .	\$1,000,000.00	
Serial bonds issued and matured . . .	6,954,000.00	
Serial Bonds outstanding Nov. 30, 1937 . . .	35,296,000.00	
Balance of authorization . . .	22,388,533.83	
	<hr/>	\$65,638,533.83
Total Construction Fund . . . . .		\$65,638,533.83

## EXPENDITURES

Wachusett-Coldbrook Tunnel, Ware Supply . . .	\$343,903.12	\$14,064,544.03
Wachusett- Watershed Protection . . . . .	1,865.19	6,738.29
Coldbrook-Swift Tunnel . . . . .	21,452.68	5,343,795.52
Quabbin Reservoir Except Main Dam and Dike . . .	1,468,255.34	14,778,719.23
Quabbin Reservoir Main Dam . . . . .	969,526.15	3,785,517.40
Quabbin Reservoir Beaver Brook Dike . . . . .	306,988.82	2,798,972.48
Special Investigations:		
Pollution of Ware and Quinapoxet Watersheds (Chapter 66, Resolves of 1931) . . . . .	00.00	1,995.99
Setting off of a Portion of Lake Cochituate (Chapter 18, Resolves of 1936) . . . . .	312.77	12,512.58
Improving Distribution System and Preventing Pollution (Chapter 48, Resolves of 1936) . . . . .	109,877.19	115,225.80
Southern Sudbury Emergency Supply . . . . .	00.00	638,533.83
Unassigned . . . . .	-421.15	00.00
	<hr/>	<hr/>
Total Expenditures . . . . .	\$3,221,760.11	\$41,546,555.15
Unexpended Balance . . . . .		\$24,091,978.68
	<hr/>	<hr/>
		\$65,638,533.83

## RECEIPTS

Receipts from Sales . . . . .	\$90,285.15	\$351,424.33
Receipts for Rents . . . . .	42,067.11	437,037.44
All other Receipts . . . . .	3,406.01	106,272.28
	<hr/>	<hr/>
Total Receipts . . . . .	\$135,758.27	\$894,734.05

Year ending Nov. 30, 1937	Total to Nov. 30, 1937
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DISTRIBUTION OF RECEIPTS

Credited as follows:

To Assessments			
Rents and Sales, to 1928			
Assessment . . . . .	\$3,033.03		
Rents and Sales, to 1929			
Assessment . . . . .	24,343.77		
Interest, to 1928-1934 Assess-			
ments . . . . .	282.11	00.00	\$27,658.91
To Construction Fund . . . .		\$135,758.27	867,075.14
		<u>\$135,758.27</u>	<u>\$894,734.05</u>

Financial Statement Verified.

Approved.

GEO. E. MURPHY,  
Comptroller.



\*Expenditures by the Metropolitan District Water Supply Commission are made under authority of the following acts and resolves:

<i>Chapter</i>	<i>Brief Description</i>
375, Acts of 1926	Commission created; Ware Supply (Wachusett-Coldbrook Tunnel Section of Quabbin Aqueduct and Ware River intake works) and Purchase of Real Estate for Swift Supply.
111, " " 1927	Southern Sudbury Emergency Supply. (Pipe lines diverting headwaters of Sudbury river.)
321, " " 1927	Swift Supply (Coldbrook-Swift Tunnel Section of Quabbin Aqueduct and Quabbin Reservoir.)
340, " " 1928	Management of Town of Prescott by Agents appointed by Metropolitan District Water Supply Commission.
66, Resolves of 1931	Investigation of Quinapoxet and Ware Watersheds by Joint Board.
116, Acts of 1932	Dissolution of Religious Societies affected by Reservoir.
262, " " 1932	Protection of Ware and Wachusett Watersheds including Rutland-Holden Sewer.
30, Resolves of 1933	Compensation to an Injured Employee.
214, Acts of 1934	Metropolitan Water District representation on Board of Referees.
18, Resolves of 1936	Investigation by Joint Board of use of part of Lake Cochituate for boating and fishing.
33, " " 1936	State Treasurer to receive and invest Perpetual Care Funds for Lots in Quabbin Park Cemetery.
48, " " 1936	Investigation of Improvements in Distribution System, and elimination of pollution of Water Supply.
52, " " 1937	Selectmen, Trustees, or other officers of churches or cemeteries are authorized to transfer any Perpetual Care Funds to State Treasurer on written request of Metropolitan District Water Supply Commission.
347, Acts of 1937	Reimbursement of Hampshire County for Trial Costs of Superior Court cases of Metropolitan Water Supply.
348, " " 1937	Reimbursement of Hampden County for Trial Costs of Superior Court cases of Metropolitan Water Supply.
352, " " 1937	Public advertising of contracts for over \$1,000.00 by Metropolitan District Commission and Metropolitan District Water Supply Commission.

COMMONWEALTH OF MASSACHUSETTS  
METR. DISTR. WATER SUPPLY COMMISSION  
**LOCATION OF REAL ESTATE ACQUIRED FOR THE  
QUABBIN RESERVOIR**  
(TITLE VESTED IN COMMONWEALTH)

TOWNS	TOTAL - Nov. 30, 1936.		TOTAL FOR YEAR ENDING Nov. 30, 1937. (ACRES)	TOTAL Nov. 30, 1937. (ACRES)	REMARKS
	1936 ANNUAL REPORT (ACRES)	REVISED-SEE NOTE (ACRES) *			
BARRE	—	—	22	22	* Revisions have been made using acreages obtained from surveys wherever available, otherwise from deeds, property blanks, etc.
BELCHERTOWN	3,016	3,015	48	3,063	
DANA	8,939	8,923	688	9,611	
ENFIELD	8,805	8,806	20	8,826	
GREENWICH	11,012	11,012	173	11,185	
HARDWICK	3,359	3,359	218	3,577	
NEW SALEM	10,228	10,173	666	10,839	
ORANGE	19	19	—	19	
PELHAM	4,955	4,961	—	4,961	
PETERSHAM	1,457	1,469	243	1,712	
PRESCOTT	10,578	10,578	81	10,659	
SHUTESBURY	3,871	3,872	191	4,063	
WARE	829	829	48	877	
WENDELL	347	347	30	377	
TOTALS	67,415	67,363	2,428	69,791	











## STATUS OF CONTRACTS COMPLETED BETWEEN NOV. 30, 1936 AND NOV. 30, 1937

CONT. NO.	DESCRIPTION	LOCATION	SUPPLY	CONTRACTOR	BIDS OPENED	NO. OF BIDS	CONTRACT AWARDED	BASIS OF AWARD	FINAL ESTIMATE	DATE OF FINAL EST.
38	Core Wall to Bed Rock at Dam Site.	Belchertown, Enfield and Ware.	Swift	The Two Companies, Inc.	May 7, 1935	9	May 9, 1935	\$,330,765.00	\$1,606,629.88	Aug. 5, 1937.
51	East Branch Baffle, Quabbin Reservoir Site.	Greenwich & Hardwick.	Swift	Franklin A. Snow Company	May 14, 1936	8	May 28, 1936	219,075.00	\$199,045.99	July 21, 1937.
54	Construction of Dana-Petersham Highway.	Dana & Petersham.	Swift	Carlo Bianchi & Company	May 7, 1936	14	May 7, 1936	68,040.00	63,840.60	Dec. 7, 1936.
55	Portion of Petersham-New Salem Highway.	Peter'sham	Swift	Arute Bros. Incorporated	May 21, 1936	6	June 7, 1936	251,955.25	**239,156.65	Aug. 27, 1937.
59	Drilling Well for Water Supply.	Belchertown	Swift	Wachusett Artesian Well Co.	Mar. 18, 1937	3	Mar. 18, 1937	857.50	691.28	Apr. 22, 1937.

## STATUS OF CONTRACTS IN FORCE ON NOV. 30, 1937

CONT. NO.	DESCRIPTION	LOCATION	SUPPLY	CONTRACTOR	BIDS OPENED	NO. OF BIDS	CONTRACT AWARDED	BASIS OF AWARD	PAYMENTS TO DATE
33	Purchase of Power at Shaft 1.	West Boylston	Ware	New England Power Co.	Date of Agreement	= Aug. 6, 1931	Agreed Rates	\$ 2,235.63	
42	Use of Worcester Sewerage System and Treatment Works 1/2 Rutland-Holden Sewer	Worcester	Ware	City of Worcester	Date of Agreement	May 1, 1933	Lump Sum = \$325,000.00 (Annual Charges = *)	325,000.00 775.10	
46	Connection with Rutland-Holden Sewer, & Disposal of Sewage from the U.S. Veterans Hospital.	Rutland (Note: Payments under Contract 46 are RECEIVED by the M.D.W.S.C.)	Ware	U.S. Veterans Administration	Date of Agreement	Nov. 7, 1934	Lump Sum = \$37,000.00 (Annual Charges = *)	37,000.00 1,025.23	
47	Service Building & Head House at Shaft 12 of Quabbin Aqueduct.	Greenwich	Swift	Vincent Cairn	April 17, 1936	4	April 21, 1936	34,990.00	31,176.09
48	Connection with Rutland-Holden Sewer & Disposal of Sewage from the Rutland State Sanatorium.	Rutland (Note: Payments under Contract 48 are RECEIVED by the M.D.W.S.C.)	Ware	Rutland State Sanatorium.	Date of Agreement	June 5, 1934	Lump Sum = \$60,000.00 (Contingent Charges = *)	60,000.00 None	
49	Excavating Diversion Channels at the Site of Quabbin Reservoir.	Dana, Hardwick & Greenwich.	Swift	Cenedella & Co.	Sept. 10, 1935	12	Oct. 1, 1935	79,050.00	\$ 84,789.69
50	Dike Embankment - Quabbin Reservoir.	Enfield & Ware.	Swift	The Arthur A. Johnson Corporation	Nov. 13, 1934	6	Nov. 26, 1934	1,446,655.00	1,360,702.17
52	Main Dam Embankment - Quabbin Reservoir.	Belchertown, Enfield & Ware.	Swift	Benjamin Foster Company	July 2, 1936	9	July 16, 1936	2,317,445.00	822,591.90
53	Head House at Shaft 9, Quabbin Aqueduct.	Barre	Swift	The English Construction Company	April 24, 1936	2	Apr. 30, 1936	9,300.00	\$ 8,118.90
56	Constructing Administration Bldgs. Main Dam	Belchertown	Swift	Rich Bros. Construction Co., Inc.	June 10, 1937	14	June 24, 1937	362,445.00	84,085.31
57	Portion of Petersham-New Salem Highway.	New Salem	Swift	John LaFolla Constr. Co.	July 2, 1936	6	July 2, 1936	161,109.50	**142,640.38
58	Making Core Borings (A contract by the Joint Counties of Middlesex, Norfolk, Suffolk and Worcester, Resolves of 1936)	Board under Chapter 48, Resolves of 1936	Special Investigation	Pennsylvania Drilling Company	Mar. 18, 1937	6	Mar. 23, 1937.	52,950.00	44,794.00

\* Proportion of Annual Maintenance Cost.  
 \*\* Of these amounts the State Dept. of Public Works has paid \$110,991.47 on Cont. 55, and \$60,231.34 on Cont. 57, covering the surfacing and guard rail items on both contracts, also traffic signal duct items on Cont. 55.  
 ★ \$9,500.00 of this total is held pending outcome of Contractor's petition. † Work accepted, final settlement pending.  
 (The above contracts were all awarded to the lowest bidder.)





MONTHLY RAINFALL IN INCHES AT STATIONS ON THE WARE AND SWIFT WATERSHEDS, 1937

	<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>	<u>Total</u>
<b>WARE WATERSHED</b>													
Ware River Intake													
Works*	5.33	2.32	3.04	4.17	4.28	4.91	2.26	5.73	3.78	3.58	5.84	2.84	48.08
West Rutland*	5.60	2.46	3.20	4.38	4.52	5.21	2.36	6.16	3.77	3.77	6.93	3.11	51.52
North Rutland	5.36	2.13	2.86	4.53	2.85	5.95	1.46	5.52	5.19	3.65	7.78	2.50	49.78
Williamsville	5.57	2.24	3.09	4.94	4.60	5.45	2.70	5.79	5.47	4.73	6.05	2.78	53.41
Hubbardston	5.05	2.03	2.56	4.45	4.29	5.57	1.90	6.43	4.49	3.76	6.18	2.33	49.04
1937 Mean	5.38	2.23	2.95	4.49	4.11	5.42	2.14	5.93	4.55	3.90	6.56	2.71	50.37
14-Year Mean	3.56	2.88	3.76	3.59	3.26	3.84	3.88	4.15	4.74	3.35	3.54	3.11	43.66
<b>SWIFT WATERSHED</b>													
West Ware	5.13	1.97	3.12	3.68	4.34	6.30	1.86	6.41	5.15	3.48	5.73	2.47	49.69
Enfield*	6.08	2.38	3.53	4.07	5.05	6.49	2.60	5.97	5.30	4.63	6.72	2.89	55.71
Greenwich	5.62	1.86	3.11	3.97	5.16	6.78	1.74	4.99	5.78	4.04	6.28	2.89	52.22
North Dana	5.63	1.52	3.18	4.29	5.09	Station Discontinued							
Dana	5.05	2.31	2.67	4.39	5.10	5.42	3.48	6.27	5.36	3.96	6.63	2.12	52.76
Packardsville	5.12	2.19	3.60	4.70	Station Discontinued								
Prescott	5.78	2.06	2.94	4.00	4.57	6.73	2.47	5.51	6.90	5.23	7.27	2.92	56.38
Shutesbury	5.80	2.74	3.63	4.97	5.87	8.00	2.82	7.04	4.82	5.77	7.09	3.03	61.58
New Salem	5.69	2.34	3.45	3.19	5.23	7.42	1.87	7.49	5.19	5.31	6.64	3.25	57.07
Wendell	5.63	2.75	3.55	6.75	6.10	6.75	3.25	5.13	6.44	5.79	7.07	3.20	62.41
Petersham**	5.36	2.14	3.60	4.37	4.58	6.15	3.81	3.60	4.71	4.37	6.40	2.67	51.76
1937 Mean***	5.57	2.28	3.29	4.38	5.11	6.67	2.66	5.82	5.52	4.73	6.65	2.83	55.51
18-Year Mean***	3.58	2.95	3.65	4.15	3.51	4.73	3.99	4.26	4.62	3.22	4.13	3.29	46.08

\* Station maintained by Metropolitan District Water Supply Commission.

\*\* Station maintained by Metropolitan District Commission.

Data for all other stations obtained through courtesy of State Department of Public Health.

\*\*\* Rainfall for North Dana and Packardsville stations not included in these figures as the stations were discontinued during the year.















